ENERGY EFFICIENCY IN CITIES

Background Note

Conference on Energy Efficiency in Cities

June 17-18th, 2014

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

ESMAP
Energy Sector Management Assistance Program

TABLE OF CONTENTS

INTRODUCTION

The Conference on Energy Efficiency in Cities, to be held in Mexico City this June, will examine the opportunities, obstacles and key strategies to accelerate and scale up urban energy efficiency (EE). Energy is a key dimension in the functioning of cities as it provides urban residents with services essential to their well-being, such as water, sanitation, lighting, transportation and ICTs.[1] Projected population growth and increased urbanization (especially in developing countries) will put pressure on the delivery of municipal services, which in turn will have an impact on energy consumption (with associated local and global air pollution) and often stretched municipal budgets. EE can be part of the roadmap for delivering key urban services while limiting energy consumption and expenditures and mitigating environmental deterioration.

Policies and programs can play a significant role in promoting EE in cities. National and local governments are developing action plans, with the help of NGOs,[2] development banks[i] and international financing institutions. Various organizations worldwide have put forward programs that specifically address EE in cities.

1 KEY TRENDS: POPULATION, CITIES AND ENERGY

Almost more than half of the world's population lived in cities in 2012; by 2050, this share will jump to almost 70 percent.[ii] This rapid growth will occur mainly in developing countries, and particularly in the least developed countries, whose populations are expected to double by 2050.[iii] Moreover, most of those additional inhabitants will live in cities, as the urban population of developing countries will grow from 2.5 billion in 2009 to almost 5.2 billion in 2050. Among the developing countries, the Latin America and the Caribbean region (LAC) has the highest worldwide urbanization rate with more than 82 percent of the total population and this percentage is expected to reach 90 percent in 2050.[iv]

Population growth will continue to put pressure on city infrastructures and the delivery of municipal services while stretching municipal budgets. The built-up area in cities worldwide is expected to triple in size during the 2000-2030 period and lead to more roads, aqueducts and power distribution lines, while existing systems need regular and ongoing maintenance. The structure and distribution of land use, and the sizing and expansion of urban plots and street networks will have significant impacts on energy consumption. The IEA assumes that almost 90 percent of the global energy growth by 2030 will result from the urban energy use.[v]

Furthermore, the expected economic growth in low- and middle-income countries will have impacts on energy demand as increased purchasing power can result in higher demand for goods and services, which in turn requires energy, water and other services that cities have to provide.[3] Increasingly, citizens will demand that urban infrastructure and its energy consumption be properly addressed. Indeed, a survey conducted by the Inter-American Development Bank (IDB) in November 2013[vi] in 5 major LAC cities revealed the following four general observations regarding urban infrastructure in Latin America which merit considerations: (i) urban-center inhabitants are demanding greater transparency and participation; (ii) the middle-class inhabitants think the quality

[1] information and communications technologies
[2] Non-governmental organization
[3] While just over 30% of the world's population is currently in the middle-class group, studies show that as much as 50% to 65% of people may reach this status by 2030.

of transport significantly affects their quality of life since they are the largest group of public-transport users; (iii) basic services, such as water, sanitation and electricity, or rather the poor quality of these services, continue to cause inconveniences for the lower economic classes in the megacities of the region; and (iv) most inhabitants believe that the effects of climate change are directly affecting them.

Cities are also economic engines of growth that generate as much as 70 percent of the global GDP. In the U.S., the 100 largest metropolitan areas generate more than 75 percent of its national GDP. In India, 30 percent of the population lives in urban areas, which generate over 60 percent of the country's GDP and account for 90 percent of its tax revenues.[vii]

To remain competitive and attract businesses that will contribute to a country or a region's economy, a focus on urban EE will be critical in enhancing its resilience against energy price rises and volatility, and energy supply disruptions. If these measures are to take place, then it would be important to bring together the different key stakeholders to foster policies that will unleash implementation of energy efficiency in cities. These include national and local governments developing and implementing action plans targeting EE in cities; as well as many NGOs, development banks[viii] and organizations that are putting forward programs to support cities in coping with their challenge and pursue their growth and development plans.

2 ENERGY AND ENERGY EFFICIENCY IN CITIES

Cities are major energy consumers and, as discussed above, cities' energy consumption will increase as urban population and economy continue to grow. EE measures can bring important benefits to cities and help ensure urban energy security and environmental co-benefits. However, some barriers can prevent achieving some seemingly easy objectives and targets.

2.1 ENERGY USAGE IN CITIES

Urban areas and their citizens consume 76 percent of the electricity worldwide. There are various areas of energy consumption in urban areas are, including the buildings, transportation, water and sanitation, solid waste management, and industries subsectors. The proportions of energy use for these different sectors depend on numerous factors, with the main ones being climate, the income-level and economic activities. A study conducted by UN Habitat showed that for middle-income cities, such as Mexico City and Buenos Aires, the typical energy-consumption breakdown among sectors is approximately 24 percent by buildings, 22 percent by the industrial sector, and 54 percent by transport.[ix] Transport is the largest urban energy consumer, and its share is projected to increase as the motorization rate and urban sprawl continue to grow.

Urban water and sanitation services account for a much smaller share of the urban energy use, but notwithstanding important. It is estimated that approximately 2 percent to 3 percent of the world's energy consumption is attributable to water treatment and pumping.[x] However, since only 73 percent of urban households have access to piped water in developing countries,[xi] increased development and urbanization will result in an increase in those services. Additionally, the water sector and street lighting can take up a very large proportion of a city's budget; according to estimates by the US government, these two kinds of service can respectively make up 30 percent and 40 percent of the total electricity bill of a city.[xii]

It is also important to look at areas where governments can exert the greatest influence to encourage EE-related efforts and where significant portions of budgets are spent on energy expenditures. For example, The World Bank's Tool for Rapid Assessment of City Energy (TRACE)[4], deployed so far for more than 30 cities around the world, including Puebla and Leon in Mexico, and Bogota in Colombia, is used to establish a first diagnostic to help cities rapidly identify EE opportunities. This tool considers the following municipal sectors with highest energy use: (i) transport; (ii) buildings; (iii) water and waste-water; (iv) public lighting, (v) power and heat; and (vi) municipal solid waste.

2.2 ENERGY EFFICIENCY – OPPORTUNITIES AND CHALLENGES

Quite a few factors can facilitate or hinder making investments in EE in the main energy uses in an urban environment. By implementing EE, major benefits can be generated and sometimes even quite easily. However, even though EE initiatives are technically and economically viable, there are still barriers to their implementation, such as lack of appropriate regulatory/policy approaches, institutional mechanisms, financial incentives, as well as low levels of EE-related awareness.

2.2.1 Opportunities

Many EE measures are cost-effective with relatively short payback periods. For instance, the cost of light emitting diode (LED) technology is dropping at about 10 percent per year, and can thus effectively reduce energy consumption of street lighting by 35 to 55 percent, with payback periods under 10 years[xiii] and longer useful lives. In fact, the city EE diagnostics undertaken using the World Bank's TRACE have shown public lighting as a key urban energy consumer. It is also important to note that efficient public lighting contributes to better lighting for people and vehicles, enhancing safety and security in the city.

Electricity costs associated with pumping and treating water and wastewater usually account for 5 percent to 30 percent of total operating costs; this share is even higher (up to 40 percent or more) in developing countries. EE is a core measure for not only reducing operating costs of water and wastewater utilities, where potential energy savings are estimated to be 10 percent to 30 percent, but also helping improve water access for the poor.

Solid waste management, on which municipalities usually spend about 20 percent to 50 percent of the available budget, also offers potential for EE gains (along with financial savings) through improved fleets, optimization of collection routes and more efficient processing facilities. In the cities where electricity prices are high, many of them are looking at the opportunities for waste-to-energy solutions (e.g., generating electricity from the captured methane gas).

Globally, buildings consume about 40 percent of the electricity and generate about 70 percent of urban greenhouse gas (GHG) emissions. According to the IEA scenario, by 2030 (World Energy Outlook (2012)), about 80 percent of the EE potential in buildings remains untapped. In buildings, simple measures, such as improving wall and window insulation, have become the norm in many developed countries. High-efficiency technologies, such as LED lighting, super-efficient heat pumps, condensing furnaces and advanced ventilation controls, are also being used in both

[4] TRACE is a tool managed by the World Bank's Energy Sector Management Assistance Program (ESMAP). Consult the following link for more details: http://esmap.org/TRACE.

retrofitted and new buildings. Low- and middle-income countries, on the other hand, have an important opportunity: the large quantity of buildings that will be built in the coming decades is much bigger than their existing building stock. Thus, by building efficiently from the start, they have the chance to improve EE at a fraction of the cost of retrofitting and can lock in energy and water savings for decades.

In addition to using energy-efficient technologies, integrating energy and EE considerations into urban planning offers important energy-consumption reduction opportunities. As discussed above, in middle-income cities, transportation is the single most energy-consuming use. In this aspect, developing countries have an advantage over developed countries: as urban environments are still growing, developing countries have the opportunity to implement appropriately designed urbanization and transport development and control urban sprawl and auto-centric suburbs, by shaping the cities' energy efficiency strategies and influencing now the designs and growth plans, including those for the public transportation systems.

Efficient public transportation encourages people to use less their cars, therefore reducing the total vehicle-kilometers driven and associated fuel consumption. Additionally, it reduces air and noise pollution, traffic congestion, road fatalities and many related health concerns.[xiv] The UNEP suggests that "of the various channels through which investment can flow into green transport, investment in infrastructure offers the greatest potential for economic growth".[xv]

2.2.2 Challenges

Although great EE opportunities have been opened up by new knowledge and technologies, there exist multiple challenges that cities have to deal with. Barriers may include the following:

- market and governmental budget constraints (economic and financial barriers);
- limitations due to government power and structure (political and policy barriers);
- human and technical resources available (institutional capacity barriers); and
- the capacity to communicate and share knowledge with both the public and decision-makers (awareness and visibility barriers).

The following table provides a brief analysis of each type of challenge.

Type	Challenge
Economic and Financial	› Limited funds available to cover upfront cost of EE, often due to concurring urgent needs › Limited access to financing and appropriate instruments (Most cities do not have a "high enough" rating of credit-worthiness.) › Ineffective bank credit products to satisfy the needs of EE investment opportunities › Subsidized consumer prices of energy increasing payback periods for EE investments › Problems of split incentives: those who pay for the EE improvements are not those who benefit from them
Politics and Policies	› Limited powers of local governments on the energy policies and the tariff structure › Lack of coordination and common goals among various levels of government and government agencies. › Short election cycles preventing EE projects from achieving long-term benefits › Absence of regulations to incentivize cities to put forward EE programs
Institutional capacity	› Understaffed governmental agencies for urban planning and EE, which are unable to deal with procurement, implementation, monitoring and verification of projects or to verify compliance with new standards › Lack of capability to perform diagnostics and assessments of city energy use and EE potential › Fragmentation of energy and environment-related responsibilities, leading to ineffective strategies
Awareness and visibility	› Intangible value of EE, as opposed to energy supply, since EE is not a traded commodity (except in the carbon market in some countries) › Lack of awareness regarding energy use, EE potential and opportunities associated with new and existing technologies, simple energy management practices (monitoring and verification programs) and new business models. › Lack of internationally recognized indicators to benchmark EE of various countries on a comparable basis › The overall effects of EE measures difficult to determine or describe at the national level to justify investments

3 ENERGY EFFICIENCY POLICIES AND PROGRAMS FOR CITIES

Projected growth in energy demand is largely driven by population and economic growth; however, government policies at national and sub-national levels, along with technology development and innovation, and financial solutions, will play an important role in dictating the pace.

3.1 ROLE OF NATIONAL AND SUBNATIONAL GOVERNMENTS

National governments can provide important regulatory frameworks to facilitate and incentivize EE, and also play an important role in supporting EE in cities by providing funding and channeling funding from international donors.

The EE initiative in cities usually begins with the city government itself. In many instances, cities provide opportunities for innovation, whereas political economy prevents or constrains national-level action. Mayors are often on the front-lines for ensuring service delivery, improving the urban population's quality of life, and dealing with air pollution and competitiveness issues.

One of best known examples is Curitiba, Brazil. The Brazilian government allowed the city to use World Bank funds in the 1970s to initiate its world-renowned bus lane system, which has resulted in large-scale reductions in gasoline usage by cars in the city. Since then, Curitiba's "bus rapid transit" (the first of its kind in the world) has been a source of inspiration for many other cities.

A key challenge for many cities is the ability to raise their own funds. A low creditworthiness rating is also a common obstacle for many cities. They often need to work with national governments and international donors to secure funding to cover both pre-investment development and transaction costs of EE programs and subsequent implementation costs. Different models are being used or explored, such as structuring funding arrangements so that it can be paid back from cities' energy savings.

3.2 SOME SOLUTIONS FOR ACHIEVING GREATER ENERGY EFFICIENCY AT THE CITY LEVEL

There are a number of EE measures that cities can pursue either on their own or in collaboration with their national governments. These include EE financing techniques, educational programs, improved municipal procurement procedures, and adoption of EE or green building codes and labeling.

Although cities may not have the authority to regulate the EE of appliances or industrial processes or may not be allowed to mandate electric and gas utilities to perform demand-side management, they can be a strong voice in advocating that the national government pursue these actions.

Cities can also take steps to improve the EE of their own municipal governments through an improved procurement process that takes energy consumption into consideration in the procurement of lights, air-conditioners and other energy-consuming equipment. If national policy allows it, they can issue tenders for the long-term purchase of energy services from performance contractors.

City-driven EE initiatives usually start with the adoption of energy policies, strategies and action plans that lay out a vision for improved EE in transportation, industry, households, and public institutions, and a set of steps in each sector, either through direct city government action or through collaborative efforts with businesses, utilities, and the national and provincial government. Small energy offices are often established within the city government to both implement EE programs and coordinate the efforts of other city offices that govern transportation, business development, and land use. One of the key determinants of whether a city's EE policy will be successful is the availability of financial resources.

3.2.1 Financing Mechanisms

Most cities in developing countries are restricted on how much money they can raise through taxes. In some cases, they receive revenues from property taxes, taxes on the sale of property, etc. But in most cases, these taxes are limited by the national government, which provides most of the cities' revenues. Likewise, with some exceptions, most cities are prohibited from taking out loans or issuing bonds. There are a number of financing techniques that have been used to pay for EE improvements in cities, including: budget capture, municipal bonds, energy performance contracting, and the energy efficiency fund.

Budget Capture

For cities where their municipal utility budgets are funded by the national ministry of finance (MOF), it may be possible for the MOF to provide extra funds to municipalities for EE projects and take "repayment" in the form of lowered appropriations to the municipalities in future years. The size of the reduced appropriation would be based on the amount of measured savings. The flow of funds to pay for energy-efficiency improvements can follow the same route as the normal appropriations for paying utility bills. For instance, such an approach is being used in Macedonia.[xvi]

Municipal Bonds

Financing EE can be much easier in cities that have bonding authority. The main type of municipal bond is the general obligation (GO) bond, backed by the full faith and credit of each municipal government, which is essentially the projected tax base of the municipality. So bond buyers can feel secure because the city government is committing its future tax revenues to bond repayment. The size of the bond issuance by each municipality is necessarily limited by the size of its tax base. The City of Varna, Bulgaria issued a GO bond to finance the upgrading and modernization of its streetlights. The project's payback was 2 years and 9 months, and the bond was paid back using energy savings over three years.[xvii]

Energy Performance Contracting

Cities can use energy performance contracting (EPC) to improve EE in city facilities. Under an EPC contract, the energy services company (or ESCO) is paid with the project's energy savings. EPC is usually employed as a financing solution for cases where the ESCO provides the financing and takes a share of the savings. Typically, the ESCO uses debt capital to pay for the project and must therefore be able to qualify for a bank loan. Since the EPC approach uses energy savings to pay the contractor, the technique usually requires approval by national governments, which would otherwise capture the savings on utility bills for itself. The EPC approach might not work in cases where cities have insufficient funds to regularly pay their utility bills. Several Indian municipal

corporations, such as the twin cities of Hubli-Dharwad[xviii] in India have entered into shared savings performance contracts with ESCOs to improve EE of their street lighting.

Energy Efficiency Fund

Many countries have EE funds that provide either direct funding for EE projects or co-finance the projects with commercial banks. Typically, the funds are revolving and can operate on a national, provincial or municipal level. They can be structured to either aggressively seek out projects, market EE loans, work closely with potential borrowers, perform loan intake, supervision, and collection services, or they can play more of a supportive role and simply dispense subsidy funds through commercial banks after the banks and an independent project management unit have certified that proposed EE projects are financially and technically feasible.

3.2.2 Awareness-raising and Capacity-building

Awareness-raising is often needed to help cities better understand their energy use and identify EE potential. Capacity-building is also needed for city EE programs and especially at the beginning of an EE initiative to meet the following needs:

- To train and organize the staff of a city's energy office or program management unit;
- To help structure a basic energy end-use database to identify energy use trends and EE opportunities;
- To identify statutory and regulatory barriers to EE that have to be addressed by the municipal government;
- To help prepare a short- or medium-term EE action plan;
- To structure an EE financing program; and
- To train energy management staff at large energy-using facilities.

3.2.3 EE Building Codes

One of the most obvious opportunities for cities to increase EE is through the adoption of energy-efficient building codes. In many countries, building codes fall within the jurisdiction of local governments. So, incorporating EE into existing codes requires no additional legal authority. There are many existing model codes that cities can consult and adapt when developing their own EE codes. Some cities, such as New York City and Los Angeles, have adopted their own EE codes, namely the New York City Energy Conservation Code (NYCE)[xix] and the Los Angeles Green Building Code (LAGBC)[xx]. Even when the code has been developed, the most difficult component is probably code enforcement. Finding capable professionals who understand code compliance can be challenging for many cities, and the budget is often insufficient to pay for inspections and enforcement actions.

3.2.4 Standards and Labelling

As a first step in adopting an EE code for buildings, some countries and cities implement buildings rating or labeling programs, which identify buildings' levels of EE. Each building's EE can then be "benchmarked" or compared to other buildings of the same type. Although labeling itself does not save energy, it provides essential information to building owners, who may be motivated to take action if their building is less energy-efficient than others of the same type in the area.

As for commercial buildings, such ratings or labelling could help enhance the value of more energy-efficient buildings and increase the demand for such buildings. In Beijing, Shanghai, and many other Chinese cities, many urban buildings are built per specifications; in the competition for tenants, buildings designated with a "Three Star" label as a green building according to the Green Building Evaluation Label[5][xxi] have allowed developers attract tenants, who increasingly care about the environment and EE.

3.3 EXAMPLES OF PROGRAMS, POLICIES AND INITIATIVES FOCUSED ON ENHANCING EE IN CITIES

Worldwide, numerous initiatives have been developed and are being developed to support greater EE in urban areas. The following selection of examples has been chosen based on their relevance and scale (but the list is not exhaustive). Exemplifying various types of activity aimed at EE in cities, the selected initiatives are identified by the following code names:

- AR: Awareness-raising (among the general public and city officials).
- CB: Capacity-building and technical assistance.
- TD: Tool development.
- NET: Networks for peer-learning and motivation.
- FI: Financing.
- POL: National and/or local policy development.

3.3.1 International

World Bank Programs:

a. ESMAP Energy Efficient Cities Initiative (EECI) – TD, NET, FI, CB

In October 2008, ESMAP launched the EECI to help cities around the world meet their energy challenges in partnership with other organizations. ESMAP, under EECI, has developed TRACE, a tool for reviewing the overall performance of a city's existing systems, identifying sectors where the most significant improvements can be made, and providing a list of policy recommendations, practical actions, and investment options to save energy and lower costs. TRACE has been deployed in 27 cities in Africa, Asia, Europe and Central Asia, and Latin America. It has also developed a series of case studies and knowledge products targeting urban EE.

[5] it is the green building authentication system managed by Ministry of Housing and Urban-Rural Development of the People's Republic of China (MOHURD).

In 2013, the City EE Transformation Initiative (CEETI) was launched, which is a 3-year technical assistance program with a stronger focus and an initial budget of USD 9 million. In its first round of grant allocations, CEETI is doing technical assistance work in 10 cities in Brazil, China, Macedonia, Pakistan, South Africa, and Ukraine. This initiative targets 50 cities by providing assistance with building capacity and identifying projects that can improve their EE. It also involves developing an e-learning module on various urban EE themes and sectors.

b. Low-Carbon Livable Cities (LC2)[xxii] – CB, TD, FI

Announced in 2013 by the WB, the LC2 initiative's goal is to reach 300 cities in the world's largest developing countries with planning and financing support over the next four years. It supports cities as they embark on a journey of low-carbon development through the following activities: (i) the City Climate Planner Accreditation Program; (ii) the Climate Action Planning Calculator; (iii) the ILEF (International Lighting Efficiency Facility); and (iv) the City Creditworthiness Initiative.

c. IFC EDGE Green Building Program - CB, FI

This program seeks to speed up market transformation in the buildings sector (houses, hospitals, apartment buildings, hotels, and offices) and enable the adoption of green building design in low- and middle-income countries by pursuing a four-pronged approach to market transformation in the buildings sector: (i) advice to governments on green building codes; (ii) IFC investments in green buildings; (iii) introduction of green mortgage and construction finance products to lenders including technical assistance and financial support; and (iii) a simple, voluntary, low-cost green building certification system. The objective is to reduce energy, water and material consumption by 20 percent. Since July 2013, the World Green Building Council has been acting as a delivery partner for the IFC'S EDGE Green Building Certification.

Cities Alliance[xxiii] - AR, POL, NET, POL

The Cities Alliance, established in 1999, is a global partnership for urban poverty reduction and the promotion of the role of cities in sustainable development. The Cities Alliance's overall strategic objectives are to support cities in providing effective local government, an active citizenship and an economy characterized by both public and private investment. By the end of 2012, Cities Alliance funded a total of 298 projects with an overall grant amount exceeding USD 91 million[xxiv].

International Council for Local Environmental Initiatives (ICLEI)[xxv] – NET

Founded in the early 1990s, ICLEI is the world's leading association of cities and local governments dedicated to sustainable development. It is a powerful movement of 12 mega-cities, 100 super-cities and urban regions, 450 large cities as well as 450 medium-sized cities and towns in 86 countries.

World Mayors Council on Climate Change[xxvi] – NET

Created in 2005, the World Mayors Council on Climate Change is an alliance of 80 committed local government leaders concerned about climate change. They are calling for enhanced involvement by local governments as governmental stakeholders in multilateral efforts addressing climate change and related issues of global sustainability. The Chair of the Council is Marcelo Ebrard, Mayor of Mexico City.

Clinton Climate Initiative[xxvii] (CCI) and C40 Cities Climate Leadership Group[xxviii] – AR, CB, NET

Since 2006, the (CCI) Cities program has been working in an aligned partnership with the C40 Cities Climate Leadership Group, a network of 63 large and engaged cities from around the world committed to implementing meaningful and sustainable climate-related policies and programs. One of the programs, the Climate Positive Development Program (CPDP), is currently working with Development Partners on 18 projects across six continents.

Sustainable Cities Program (SCP)[xxix]- TD, AR, POL

Established in the early 1990s, the joint UN-HABITAT – UNEP Sustainable Cities Program promotes environmental, social and economic sustainability of cities through an environmental planning and management (EPM) approach, which is characterized by a broad-based, participatory decision-making process. Currently, the SCP and its sister program Localizing Agenda 21 are being actively implemented in approximately 40 cities and 30 countries around the world.

Mexico City Pact[xxx] - NET

Launched in November 2010, the Global Cities Covenant on Climate (nicknamed “the Mexico City Pact”) is a voluntary initiative by mayors and local authority representatives aimed at advancing climate-change-mitigation actions. Its key declaration states the considerations as to why cities are strategic in combating global warming and a set of 10 voluntary commitments to promote strategies and actions aimed at mitigating GHG emissions, adapt cities to the impacts of climate change and foster cooperation among cities. In December 2012, 286 cities in five continents representing a total population of approximately 270 million inhabitants signed the Mexico City Pact.

Global Initiative for Resource-Efficient Cities[xxxi] - CB, NET

Cities with populations of 500,000 or more are invited to join this initiative launched in 2012. It aims to attract 200 members by 2015. This initiative seeks to connect the many different entities working on resource efficiency around the world, using UNEP’s convening ability to mobilize partners and different constituencies, including national and local governments, civil societies, businesses and industrial enterprises and other major groups. Several cities have already come on board, including the City of São Paulo, Malmö, Heidelberg, Quezon City, Gwangju, and national interest has been expressed by Japan, Brazil, France and the United States.

3.3.2 Regional and National

European Initiatives

Smart Cities[xxxii] - NET

The “Smart Cities” project was created in 2010 to help European cities become sustainable and intelligent. Cities that wish to work as pioneers, taking greater risks in choosing technologies and processing experimental organizations, can receive grants dedicated to this purpose. With around 1,000 cities participating, it provides a web-based and a physical platform.

Covenant of Mayors[xxxiii] - NET

Launched in 2008, this initiative is a mainstream European movement involving local and regional authorities, voluntarily committed to improving EE and increasing the use of renewable energy sources in their jurisdictions. The covenant signatories are committed to meeting and even

exceeding the European Union's 20 percent CO_2 emissions reduction target by 2020. So far, 5,733 cities, representing more than 180 million inhabitants, have joined this initiative.

Energy Cities[xxxiv] - NET, AR, POL

Energy Cities is a European association of local authorities in energy transition. Created in 1990, the association's membership now includes more than 1,000 towns and cities in 30 countries. Its main objectives are to strengthen cities' role and skills in using sustainable energy, influence the policies and proposals made by European Union institutions on energy, environmental protection and urban policy and develop and promote initiatives through experience-sharing, know-how transfer and implementing joint projects.

CONCERTO Initiative[xxxv] – AR, CB, TD, NET, POL

The CONCERTO initiative started in 2005. The program aims to help cities and communities cut CO_2 emissions of existing buildings at an acceptable cost and demonstrate that optimizing the entire buildings sector is more cost-effective than optimizing each building individually. So far, it has supported 58 cities and communities. CONCERTO Premium adds value to the CONCERTO projects by supporting the European Commission and contributing to the continued success of the CONCERTO initiative by carefully dealing with scientific, technical and political issues and concerns.

USA

City Energy Project[xxxvi] (CEP) – AR, FI

Created in 2014, the CEP is a national initiative aimed at creating healthier and thriving American cities by improving the EE in buildings. Working in partnership, this project and participating cities support innovative and practical solutions that boost local economies, reduce pollution, and create healthier environments. The pioneering actions of the 10 leading cities[6] involved in the City Energy Project will help shape and define next-generation of EE efforts in communities nationwide.

China

WWF Low Carbon City Initiative[xxxvii] (LCCI) – POL, CB, NET, FI, AR

Started in 2007, LCCI promotes technology transfers and other exchanges between China and developed countries. LCCI's first stage included pilot projects in Baoding and Shanghai. Then, Beijing joined this initiative. In 2010, the Chinese government launched its own program for low-carbon cities, building on the results of the WWF initiative. In 2011, the project was integrated into the 12th five-year plan.

LAC

Emerging and Sustainable Cities Initiative (ESCI)[xxxviii] – CB

The Emerging and Sustainable Cities Initiative (ESCI) offers technical assistance to help intermediate cities in the LAC region identify, prioritize and structure projects in a manner that will ensure their sustainability at environmental, urban and fiscal levels. In 2011, ESCI started with five pilot cities: Port of Spain in Trinidad and Tobago, and Trujillo in Peru, Goiânia in Brazil, Montevideo in Uruguay and Santa Ana in El Salvador. In 2013, 15 cities joined the program and the long-term objective is to partner with 50 cities.

[6] Atlanta, Boston, Chicago, Denver, Houston, Kansas City, Mo., Los Angeles, Orlando, Philadelphia, and Salt Lake City.

3.4 SOME LAC CITY EXAMPLES

3.4.1 Mexico City's Climate Change Action Plan[xxxix]

Climate change is a sweeping concern that cuts across the main components of Mexico City's environmental and development policies, including those related to energy, water, mobility, soil conservation, economic development, waste generation and management, vulnerability, transportation and environmental education. In the framework of the Mexico City Climate Action Program[xl], policies and actions regarding efficient water use and supply are linked to those dealing with risks. This program was prepared by the Federal District Government. A total of 26 greenhouse gas mitigation actions, across the sectors mentioned above, have been proposed in the Mexico City Climate Action Program.

The EE component for the Federal District Government infrastructure aims at improving the efficiency of lighting in public buildings as well as of street-lighting, and developing an efficient operation of electric transportation. Two other components are (i) the establishment of an environmental certification system for commercial and residential buildings and (ii) a program for distributing compact fluorescent lamps among residents in the Federal District.

The 2008-2012 Mexico City Climate Action Program achieved 7.7 million tons in CO_2e emission reduction, corresponding to a 4.5 percent reduction compared to the 2012 baseline, exceeding its goal by 10.2 percent.[xli]

3.4.2 Rio de Janeiro[xlii]

During the Rio+20 Summit in 2012, the City of Rio de Janeiro and the World Bank launched an urban-level program aimed at accomplishing the city's goals for low-carbon development. Certified as per the ISO standards, the Rio de Janeiro Low Carbon City Development Program will help Rio de Janeiro monitor and account for low-carbon investments and climate change mitigation actions across different sectors in the city. Its target is to reduce CO_2 emissions by 2.3 million metric tons by 2020 and this figure is equivalent to 20 percent of the city's 2005 emission level. A variety of projects and policies across a number of urban sectors will be implemented to achieve this target, such as doubling the city's network of bike paths, the opening of the first of four exclusive Bus Rapid Transit (BRT) lanes, providing universal access to basic sanitation in Zona Oeste, the city's most populous area and two initial pilot projects in the areas of urban forestry.

The Program is a business model that can be applied to other cities around the world. The program has the potential to expand over time to include a wide range of municipal activities, thus institutionalizing a 'carbon lens' through which ultimately all municipal activities may be scrutinized.

3.4.3 Curitiba[xliii]

The city of Curitiba, Brazil, is well known for its innovative land-use planning and integrated transport planning. As early as in 1966, Curitiba adopted a master plan that set out the vision for a city well serviced by public transportation, and in the 1970s and 1980s, the bus system started to develop quickly, and a bus rapid transit (BRT) system was put in place. Now covering almost 90 percent of the city's territory with an average ridership of 45 percent, the bus service ensures that all routes are serviced at roughly a five-minute interval. Because the investment cost of the BRT was much lower than a tram or a subway system, the system pays for itself through fares.

As a result, the annual fuel losses per capita from severe traffic congestion is 13 times less than in São Paulo, and fuel usage is 30 percent lower than that of Brazil's other major cities' average.

Furthermore, the “walkability” of the downtown area has been improved, by, for example, transforming selected streets into pedestrian walkways, so that citizens are encouraged to use a mix of public and human-powered transportation. Other environmental initiatives, not directly linked to EE, have also been put in place, such as natural drainage systems and enhanced green recreational areas.

APPENDIX I
REFERENCES

[i] The World Bank has developed city-specific programs for energy efficiency and GHG reductions, such as the Carbon Finance Capacity Building Program, as well as tools for municipal decision-makers.
[ii] http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/
[iii] http://esa.un.org/wpp/Documentation/pdf/WPP2012_%20KEY%20FINDINGS.pdf)
[iv] http://publications.iadb.org/bitstream/handle/11319/6415/MegacitiesSurvey.pdf?sequence=3
[v] http://www.iiasa.ac.at/web/home/research/Flagship-Projects/Global-Energy-Assessment/GEA_Chapter18_urban_lowres.pdf

[vii] WWWF. 2010. *"Urbanization and Sustainability in India: An Interdependent Agenda"*
[viii] The World Bank has developed city-specific programs for energy efficiency and GHG reductions, such as the Carbon Finance Capacity Building Program, as well as tools for municipal decision-makers.
[ix] http://www.iiasa.ac.at/web/home/research/Flagship-Projects/Global-Energy-Assessment/syncity_wp.pdf
[x] http://www.watergy.org/
[xi] http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/05/03/000356161_20120503035610/Rendered/PDF/682800ESMAP0WP0WWU0TR0010120Resized.pdf

[xiii] Experience from Optima Energía projects in Mexico.
[xiv] http://www.unep.org/urban_environment/PDFs/SustainableResourceEfficientCities.pdf (p.34)
[xv] http://www.unep.org/urban_environment/PDFs/SustainableResourceEfficientCities.pdf (p.34)
[xvi] "The Greening of Macedonia's Public Buildings," The World Bank, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/03/14/000442464_20140314135046/Rendered/PDF/860360WP0P1159960Box382163B00PUBLIC00ACS.pdf
[xvii] Silvia Rezessy and Paolo Bertoldi, "Financing Energy Efficiency: Forging the Link between Financing and Project Implementation," European Commission, Joint Research Centre, Institute for Energy, May 2010, p. 8.
[xviii] "Energy Efficiency in Street Lighting through ESCOs at Hubli-Dharwad," Infrastructure Development Department, Government of Karnataka, June 2012, http://www.iddkarnataka.gov.in/docs/81_DMA_PFR_EnergyEfficiencyinStreetlightingatHUbli_final.pdf
[xix] http://www.nyc.gov/html/gbee/html/codes/codes.shtml
[xx] http://ladbs.org/LADBSWeb/green-bldg.jsf
[xxi] http://www.gbmap.org/en/1015new.php?cat_id=127
[xxii] http://www.worldbank.org/en/news/press-release/2013/09/25/world-bank-initiative-planning-finance-challenges-300-low-carbon-livable-cities
[xxiii] http://www.citiesalliance.org
[xxiv] http://www.citiesalliance.org/sites/citiesalliance.org/files/CG%20Portfolio%20Review%2023%20Oct%2012.pdf
[xxv] http://www.iclei.org/
[xxvi] http://www.worldmayorscouncil.org/
[xxvii] http://www.clintonfoundation.org/our-work/clinton-climate-initiative/programs/c40-cci-cities
[xxviii] http://www.c40.org/
[xxix] http://ww2.unhabitat.org/programmes/sustainablecities//
[xxx] www.mexicocitypact.org
[xxxi] http://www.unep.org/newscentre/default.aspx?DocumentID=2688&ArticleID=9179
[xxxii] http://eu-smartcities.eu
[xxxiii] www.covenantofmayors.eu
[xxxiv] http://www.energy-cities.eu
[xxxv] www.concerto.eu
[xxxvi] http://www.cityenergyproject.org/
[xxxvii] http://en.wwfchina.org/en/what_we_do/climate___energy/mitigation/lcci/
[xxxviii] http://www.iadb.org/en/topics/emerging-and-sustainable-cities/emerging-and-sustainable-cities-initiative,6656.html
[xxxix] http://www.citiesalliance.org/sites/citiesalliance.org/files/A_city-wide_approach_to_carbon_finance.pdf

[xl] http://www.sma.df.gob.mx/sma/links/download/archivos/paccm_resumen.pdf
[xli] http://c40.org/blog_posts/mexico-city-meets-exceeds-climate-action-program-goals
[xlii] http://www.worldbank.org/en/news/press-release/2012/06/18/rio-world-bank-launch-ground-breaking-program-low-carbon-city-development and http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/01/09/000425962_20130109142714/Rendered/PDF/NonAsciiFileName0.pdf
[xliii] http://www.esmap.org/sites/esmap.org/files/CS_Curitiba.pdf