

ABSTRACT

Transforming Urban Infrastructure for Low-Carbon Cities Issues, Options and Emerging Lessons in Developing Countries

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Consumptive and productive activities in cities account for about two thirds of global energy consumption. Cities will become even more dominant by 2030, consuming 73% of the world's energy and emitting 73% of the world's greenhouse gases (GHGs).

Developing-country cities will have a decisive impact on the global outlook of carbon stabilization in the next 20 years. They will account for about 94% of global urban population growth and 81% of global urban energy demand growth between 2010 and 2030. The world's urban built-up areas are expected to double in the next 20 years, driven by the urbanization of developing countries. These are opportunities to be seized for low-carbon growth.

With a few exceptions, developing-country cities are generally energy poor. Their citizens, especially those just migrated from rural areas, are under served with a relatively small carbon foot print. For example, per capita GHG emission of Mumbai or Ho Chi Minh City is just about a quarter of that of Paris and less than 13% of that of New York City.

Low-carbon cities need to have robust and thriving economies first and foremost. Cities are the engines of growth in developing countries and need not be judged inferior because they happen to host energy-intensive industries due to their economic geography and natural endowments. Thus, a city's carbon burden needs to be compensated for its services to economies beyond its own boundary and credited if it leads in efficiency and clean production in the industries it specializes.

How can cities in developing countries grow much richer without dramatically expanding their carbon footprints? Beside industrial and commercial activities, a city's carbon footprint is primarily determined by the energy efficiency (EE) of its urban infrastructure services (e.g., EE in buildings and transport, etc.), its ability to reduce and manage wastes (e.g., recycling), and its uptake of low carbon technologies (LCTs).

The three principles of low-carbon growth for cities are maximizing EE, minimizing waste, and capitalizing low-carbon technologies (LCTs). While few cities have been able to achieve on all fronts at scale, there are many successful examples in specific areas among many developing countries (e.g., bus rapid transits - BRTs, building energy codes, recycling, and solar hot water heaters). The rest of the discussions focus on how these principles may be applied to transform urban infrastructure for low carbon cities.

Lessons and technologies from developed-countries are important. But the solutions will likely come from developing countries' own innovations, just like Curitiba, Brazil, which pioneered BRT; Rizhao, China, which became the first city having nearly universal solar hot

water supply; or the State of Gujarat, India, which implemented a large-scale bundling of municipal EE projects involving over 160 cities and towns.

Maximizing EE in cities encompasses a wide spectrum of activities which cities can take to minimizing their carbon footprints and profit from doing so. Key opportunities exist in urban planning, transport optimization, low-energy buildings, key municipal service (e.g., energy, water & sanitation). Globally, EE in buildings has the largest CO₂ emission reduction potential with the lowest cost between now and 2030. Another example, fuel savings from bus system optimization represent the lowest cost and highest CO₂ emission reduction option for Mexico from 2009 to 2030.

Minimizing waste in cities starts from efficient use and conservation of products and services and ends with improved management of wastes through recycling and regeneration. Landfills, wastewater management, and recycling are generally the responsibility of municipalities. Improved waste management is a significant means for mitigating growing GHG emissions in warm climate cities. For example, the waste sector represents 31% of GHG emissions in Rio de Janeiro, 24% in São Paulo.

Capitalizing LCTs in cities of developing countries will be critical to meet increased demand for energy services while limiting the expansion of their carbon footprints. This in the short to medium term is likely to require greater use of natural gas at greater efficiency through combined heat and power technologies, as well as by re-generation using recovered energy from waste (e.g., biogas from activated sludge wastewater treatment plants and methane from landfills). But some relatively low-cost LCTs, such as solar hot water heaters, still require large scale up efforts even in solar rich cities.

Aspiring cities in developing countries are articulating visions, setting low carbon targets, developing action plans, and embarking on less carbon-intensive growth paths. In fact, 23 of the C40 cities are from developing economies. This provides opportunities for international aid communities to help city governments and urban planners in developing countries transform urban infrastructure for the emerging low carbon cities. A few areas which need particular attention are highlighted:

1. Incentivizing cities and citizens
2. Building capacity and tools for planning and implementing low carbon growth
3. Optimizing existing urban infrastructure and services (energy, transport, water & sanitation)
4. Implementing building energy codes, especially in warm climate countries
5. Retrofitting existing buildings, especially in cold climate countries
6. Managing solid waste in warm climate countries