Role of Renewable Energy for Sustainable Urban Development

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Abstract

The advantages of renewable energy have been discussed in various studies with an aim of sustainable urban development. And it is widely recognized that access to and supply of modern energy play a key role in poverty alleviation and Sustainable Urban Development. Energy plays a vital role in urban development to fulfil basic needs. But access of electricity is facing challenges, how to generate energy without environmental degradation and without heavy pressure over atomic and bio fuel. Such access strategy would comprise of the supply of alternative energy carriers and planning of complete energy solutions via a more comprehensive and sustainable Urban Energy Planning i.e. Sustainable Energization for Sustainable Urban Development. The study aimed to propose and consolidate a more comprehensive Urban Energy Planning procedure for renewable energy for urban areas.

KEYWORD- Renewable Energy, Urban Centers, Sustainable Urban Development.

Introduction

Cities are the result of energy development, which more than just grouping the bulk of humanity concentrate on buildings, transportation systems, industrial processes and other innovations. Residents of cities import a large quantity of materials that are transformed through processes, which can cause critical impact at the regional and global levels (Ngo, N.S. & Pataki, D.E 2008). Energy production and consumption have considerably affected both sustainability and economy. The transition to renewable energy cuts across the entire urban energy landscape, from buildings to transport, to industry and power. Renewable energy can bring tremendous benefits to cities, including cleaner air, modern services and improved living spaces. At the same time, cities are crucial to the world's transition to a low-carbon economy, accounting for 65% of global energy use and 70% of man-made carbon emissions.

Historically, urban centers have been developed on fossil fuels. These power buildings, lighting, transport, air conditioning, water supply systems, sewage treatment and more. Indeed, not only the depletion of fossil resources and generated greenhouse gasses emissions, as a consequence of a coal and oil based model, or the occupation of natural spaces for renewable models of centralized production should be taken into account, but also the increasing cost of energy.

Energy Consumption

It is well recognized that world total energy consumption is divided into three major economic sectors: i) Household ii) transportation and; iii) industrial. Amongst these

three sectors, household including residential, commercial, light commercial and institutional signify for about one third of the total energy consumption compared to other energy-using sectors. Urban energy use significantly contributes to climate change. In 2012, global energy supply consisted of 81.3% fossil fuels (oil, coal and gas), 9.7% nuclear power, and only 9% renewable energy sources. The most recent Intergovernmental Panel on Climate Change (IPCC) report shows that urban areas consume about 67% of global energy and generate about three quarters of global carbon emissions.

Urban Energy Consumption and Environmental degradation

Urban centers are engines of economic growth and energy is a major factor for development. Demand of energy depends on level of urbanization and industrialization. Our analysis, using a dataset of 274 cities representing all city sizes and regions worldwide, demonstrates that economic activity, transport costs, geographic factors, and urban form explain 37% of urban direct energy use and 88% of urban transport energy use. If current trends in urban expansion continue, urban energy use will increase more than threefold, from 240 EJ in 2005 to 730 EJ in 2050. Share of global greenhouse gas (GHG) emissions is likely to increase as global urban populations and industrialization increase.

The global energy crisis, coupled with the threat of climate change, demands innovation in the energy sectors, and responsible consumption for both developed and developing countries. In Urban Energy Transition: From Fossil Fuels to Renewable Power, it was stated that by 2030, global energy demands are expected to increase by 60 to 85 per cent. According to the Intergovernmental Panel on Climate Change (IPCC) recommendations, if we are to limit global warming to no more than 2°C above pre-industrial levels, we cannot exceed an atmospheric greenhouse gas concentration level of 450 parts per million (ppm).

To ensure a viable, healthy and environmentally sound future, the world needs another industrial revolution, where development is fuelled by affordable, accessible and sustainable energy resources. In an attempt to reduce resource inputs and environmental impacts, some developed nations have already successfully managed to decouple economic growth from energy consumption. This has been achieved by closing the energy loop in production, such as recapturing released heat for power generation (UN-HABITAT, ICLEI, and UNEP, 2009, p. 7).

Accelerating the deployment of renewable energy and energy efficiency offer the best route to meet international development targets, including Sustainable Development Goal, which aims to make cities and human settlements inclusive, safe resilient and sustainable urban development.

There are some methods which can be used for generating renewable energy for sustainable urban development.

Anaerobic digestion

Urban waste generation and disposal is becoming a critical issue due to increasing urbanization and population growth. Anaerobic digestion, where biodegradable waste is decomposed in the absence of oxygen producing a methane-rich biogas suitable for energy production, could provide a critical solution to growing waste issues, while simultaneously reducing external energy requirements (Curry and Pillay, 2012). The biogas can be combusted to produce both heat and electricity using internal combustion engines or microturbines and hot water heaters, where the generated heat is used to warm the digesters or heat buildings (Ibid). Urban centers are source of municipal waste. If municipal waste could be utilized for biogas production, thus reducing the demand for landfill, sustainable and renewable energy could be produced alongside a beneficial by-product of bioslurry which can be used as fertilizer. A study by Curry and Pillay in the journal Renewable Energy found that the number of biogas plants is increasing each year by about 20 to 30 per cent, proving that anaerobic digestion is becoming an important sustainable energy source.

Solar power

Solar power is the best option for renewable energy. It is easily accessible through technology and can be used as a renewable source of energy, compared to biomass, hydropower, or nuclear, is that it requires no water and therefore eliminates environmental concerns regarding increasing water consumption and subsequent shortages. Recent cost reductions in the implementation of solar technologies (both concentrated and photovoltaic solar power) made them cost-competitive with fossil fuel-based power generation in both mid to high latitudes. Globally, solar photovoltaic power grew the fastest of all renewable technologies between 2006 and 2011, increasing by 58 per cent annually, followed by concentrated solar power, which increased by almost 37 per cent, and wind power which grew by 26 per cent, as reported in an energy policy study (Purohit, Purohit and Shekhar, 2013). Solar power for urban application is effective as panels and photovoltaic materials can be placed on the roofs of buildings, where they are non-obstructive, efficient and low maintenance.

Efficient infrastructure

In the future, the development of on-site renewable energy production could lead to zero emission buildings and highly energy efficient low carbon eco-cities (Lund, 2012). New innovative technologies are introducing every day, making cities more energetically sustainable. For example, a wind and solar is being developed for application in urban high-rise buildings to optimize energy production. It helps to minimize issues with current urban wind turbine applications.

Eco-cities

With advancing technology, there has been a rise in the number of eco-cities around the world. The implementation of renewable energies in urban environments is sometimes constrained by the mismatch between supply and demand, and their integration within the energy system. Smart grids could provide the necessary interconnections and control to manage power provision effectively. The implementation of such measures in the urban environment provides several benefits, including improved energy security

and reliability, reduced transmission costs through bringing local energy supply closer to demand, employment of existing infrastructure and minimizing demand for land (Lund, 2012).

Conclusion

Increasing the share of renewable energy sources is essential to the long-term sustainability and wellbeing of cities. Use of renewable energy on a large-scale in urban environments is of high importance as a future sustainable energy option in both meeting increasing urban energy demand and reducing emissions. As innovation of technology continues, renewable energies will become ever more efficient, user-friendly, cost-effective, accessible and sustainable.

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