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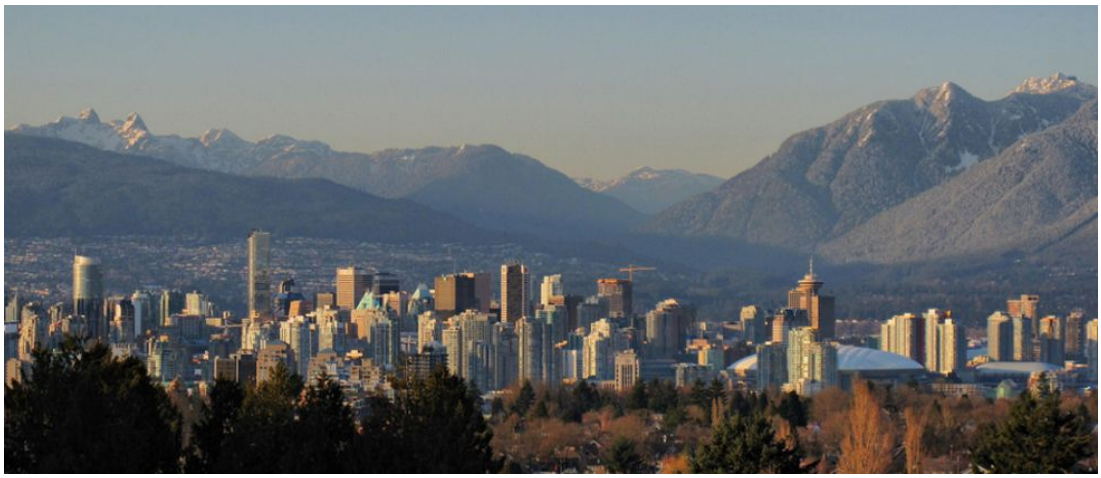
CITIES

Green Cities: Sustainability through Innovation

by Katherine Lee



With more than half of the world's population residing in urban centers, cities must lead the way in developing environmental sustainability goals that can reduce carbon emissions and inspire innovative solutions.

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What will our cities look like in the future? After landmark climate change negotiations in December 2015, the world's developed countries have pledged to dramatically reduce greenhouse gas emissions. It has become clear to policymakers and investors that leading economies have a responsibility of focusing on renewable energy. And with more than half of the world's population residing in urban centers, cities must now lead the way. These

three “green cities” have set ambitious energy goals, and are working to develop innovative sustainability measures that balance formal legislation and market incentives for environmental good.

Vancouver: The World’s Greenest City by 2050

The Greenest City Action Plan developed by the City of Vancouver has two main targets:

- **Target 1**: Derive 100% of the energy used in Vancouver from renewable sources before 2050

- **Target 2**: Reduce greenhouse gas emissions by at least 80% below 2007 levels before 2050

Vancouver hopes to make a complete transition to renewable energy by 2050. The city is seeking to reduce overall energy use, while increasing the supply of renewable energy for the population. In 2014, Vancouver relied on fossil-fuels for 69% of its energy. Transportation and buildings are the biggest sources of energy use; building heating alone accounts for 45%, and relies heavily on natural gas. For that reason, the city has focused on creating energy standards for buildings, with carbon-neutral and zero-emission standards. By the target date, 40% of the buildings in Vancouver will be retrofitted or newly built according to these standards.

To meet these objectives, Vancouver must also rely on private sector participation. As a part of the Greenest City Action Plan, the city plans to invest in businesses and renewable technology research, creating financing mechanisms to draw investors to green energy initiatives. Today, Canada ranks eighth globally in investment in renewable energy. In 2014, the national government invested CAD $31.36 billion in the renewable energy sector, putting the majority toward wind technology.

Tokyo: Carbon Emission Cap and Trade

In June 2007, Tokyo's metropolitan government created the Tokyo Climate Change Strategy, in order to mitigate greenhouse gas emissions through a cap-and-trade program. The cap-and-trade is a two-part process. The "cap" puts a limit on all emissions from specified sources, and this limit is lowered over a set period of time to further reduce total emissions. Next, the "trade" generates carbon allowances which are provided to companies. If some companies can make innovations to reduce their emissions, they can sell some of their allocated credits to other companies, thus creating incentive to reduce emissions. Therefore, a carbon market is created and ideally, the cost of a carbon credit is equal to the lowest mitigation cost out of the companies under the cap.

This is highly beneficial for a metropolitan city like Tokyo that emits 59.6 million tons of greenhouse gases annually. And because the city of Tokyo accounts for 20% of the Japan's GDP, this system puts green innovation at the center of Japan's economy. The first compliance period, from 2010 to 2014, placed a cap on greenhouse gases to 6% below the current rates of the largest emitters. The trading scheme set up by the Tokyo Metropolitan Government (TMG) covers both the industrial and commercial sectors, including some of the capital city's largest facilities – more than 1,400 office buildings and factories in total. Overall, the goal is to reduce the greenhouse gas emissions in Tokyo by 25% by the year 2020. By using cap-and-trade, the city hopes to encourage green innovation, opening market opportunities for energy efficient technology and low-cost mitigation

In 2016, Cornell University and TMG performed an audit of Tokyo's cap-and-trade system. The results showed that the system significantly surpassed its goals, already reducing total emissions by more than 20% below the base year of 2000. As a result of the close relationship forged between the municipal government and the private sector, there was also a change in investment patterns observed. Analysis showed that buildings invested heavily in energy efficient lighting and air conditioning technology, including new AC turbo chilling systems. This trend toward energy efficiency was reinforced to ease energy demand after the Fukushima nuclear reactor incident and the following energy crisis in 2011.

Munich: Sustainable Energy by 2025

The European Union has established ambitious goals to combat climate change, hoping to derive 20% of its energy from renewable sources by 2020. Munich is taking this ambition further, aiming for 100% clean energy by 2025. With a population exceeding one million, Munich must produce 7.5 billion kilowatt-hours each year. The city has invested around 9 billion euros into clean energy projects to date, such as a hydro power plant along a river inside the city and a solar plant in Spain. Since the EU's electricity grid is integrated, clean energy benefits the entire region.

The city of Munich owns the utility company, Stadtwerke München, which has already invested in an offshore wind projects – including one on Sylt Island in northern Germany. In 2014, Siemens installed 80 wind turbines that can generate 1.3 billion kilowatt-hours per year. Today, there has been a total of 1 billion euros invested into 1,300 wind turbines for 4 gigawatts of capacity. This amount of economic stimulus sustains 18,000 jobs, and the future plans to increase capacity to 9 gigawatts should stimulate further job growth, supporting a projected 33,000 positions. Overall, the goal of promoting sustainable energy has already propelled Munich's green energy sector, expanding infrastructure and jobs.

Though climate change negotiation is state led, many cities around the world are taking control, pushing their energy sources and investments into renewable energy. At a smaller level of governance, cities have more capacity for innovation and can tailor their climate change projects to benefit their region, creating cleaner jobs and a carbon free economy as a result.

Learn More: City Innovation

Our cities are home to more than 50% of the world's population. They are major hubs of governance, education, business, and now, environmental stewardship. Be on the lookout for more information about the role of the modern city in the innovation economy in our upcoming Special Issue on City Innovation, to be published in November 2016.

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