

Initiatives of Global Cities in Environmental Sustainability: A Case of London and New York City

Abu M. Sufiyan¹

¹ School of Urban and Public Affairs, University of Louisville, Kentucky, USA

Correspondence: Abu M. Sufiyan, School of Urban and Public Affairs, University of Louisville, 426 West Bloom Street, KY 40208, USA. Tel: 1-502-852-2449. E-mail: sufyleemon@yahoo.com

Received: January 16, 2013 Accepted: February 5, 2013 Online Published: February 18, 2013

doi:10.5539/jsd.v6n3p1

URL: <http://dx.doi.org/10.5539/jsd.v6n3p1>

Abstract

As global cities are the financial centers of globalized economy, they have attained much attention from global communities concerning local initiatives on environmental sustainability. Many global cities are vulnerable to global warming and adversities of climate change. In the United States, many cities and local government, including New York City, are taking their own initiatives to reduce greenhouse gas emission, whereas European cities are built historically with compact nature which is more sustainable. This study conducts a comparative analysis on local sustainability policies in New York City and London and focuses on the efficiencies of the initiatives taken by these cities. The comparative analysis reveals that there are more similarities than differences between London and New York City in regards to sustainability goals. However, approaches toward achieving sustainability goals are different in London and New York City due to dissimilarities in geography, local cultures, and diverse environmental politics. In conjunction with the government regulations, behavioral change of the citizens is also pivotal for achieving sustainability outcomes in global cities.

Keywords: sustainability, sustainable development, environmental sustainability, global city, urban sustainability, climate change, London, New York

1. Introduction

Global cities are contributing to greenhouse gas emissions and many of them are vulnerable to global warming and mishaps of extreme weather events. Due to the concentration of people and businesses, overall greenhouse gas emissions are higher in global cities. High level of energy is consumed in global cities in order to meet residential, business, and mobility needs (Crocì, Melandri, & Molteni, 2010). However, per capita energy consumption is much lower in London and New York in comparison to other megacities due to adoption of effective sustainability strategies. In the United States, many cities and local governments, including New York City, are taking their own initiatives to abate greenhouse gas (GHG) emissions. On the other hand, European cities are built historically with compact nature which is more sustainable. However, the policies at city level are not always feasible and cost-effective (Rabe, 2008). The study conducts a comparative analysis on local sustainability policies of two great global cities, New York City and London. The main objective of the study is to find how great global cities are different in their sustainability approaches. There were only two megacities in the world in 1950, London and New York City (Devuyst, 2001). Although the number of megacities growing rapidly in twenty-first century, the local sustainability policies of two of the world's foremost cities, London and New York City, are worthwhile as best practice models for other cities.

Although globalization brings outstanding wealth and opportunities for global cities, there are also momentous environmental challenges. The historical tendency has been to promote the development of cities at the cost of natural destruction, however, the current environmental enthusiasm among planners might suggest their innate disposition to environmental sustainability (Campbell, 1996). Considering these issues, the city governments of London and New York City have taken a handful of measures to ensure environmental sustainability. However, both consensus and effective communication among technical experts, administrative and political sphere are necessary for taking action for environmental sustainability. Moreover, financial resources, human resources, public interest and participation, localized information and proper monitoring and evaluation system are indispensable for implementation of policies. The mandate from national government, good local governance, regulatory framework, and cooperation among multi-level governments are also influencing the initiatives on

sustainability actions (Sippel & Jense, 2009). Substantial behavioral change has also occurred in some cities with regards to mobility and usage of automobiles (Banister, 2007). Taking into account the contextual differences, this study has analyzed two cities, New York and London to discern whether there are any differences in sustainability approach of these two cities. Firstly, a brief literature review has been conducted in order to better understand the present sustainability approach of the two cities. The sustainability approach of London and New York City are compared in terms of energy efficiency, transportation policies, air pollution level, green infrastructures, recycling and waste management, biodiversity and open space, waste management, and climate change policies of both cities.

2. Literature Review

Friedman (1986) outlines 'the world city hypothesis', which argues that the world cities, like New York and London, have become both command center and basing points for capital in globally reconstructed international production system. World cities serve as center spaces of global accumulation through flow of capital, human, information, merchandises, and other economic relevant factors. Nevertheless, global cities are not just centers of finance to distribute and produce wealth, command and services. Global cities are places where global issues, such as climate change and environmental sustainability are also attracted prominence. More importantly and directly, global cities, including London and New York, are the market place for global and domestic carbon emission credits. London City Corporation efficaciously initiated a carbon trading scheme in 1999 (Lee, 2009). Cities are now conceived as a dynamic and ecosystem, not as a metaphor but as a concept of a real city (Newman, 1999). Environmental activism is a growing phenomenon in global cities (Dalton, 2005). While cities all around the world have become noteworthy global environmental actors, the environmental role of local governments and cities remain unincorporated into the main body of global city literature, where the lack of attention to global cities research on the urban environment is one of the most disconcerting gaps in understanding global cities (Short, 2004).

It is evident from survey (Kenny, 1999) that there is hardly any evidence that rich countries are happier than poor ones and there is no evidence that economic growth (in terms of increase in GDP) generates additional happiness. Alternatively relative wealth and income are significant determinants of happiness (Kenny, 1999). The reason was identified that the irresponsible consumption of products which do not give satisfaction and sometimes creates serious health effects. Environmental deterioration caused by production and consumption are frequently unaccounted for in conventional economic indicators (Bartelmus, 1999). Although traditional economic theory posits a trade-off between economic growth and environmental quality, the rapidly expanding empirical and theoretical literature on the Environmental Kuznets Curve (EKC) (Note 1) has suggested that the relationship between economic growth and environmental sustainability can be positive (Lee, Chung, & Koo, 2005). There is a win-win zone between environment and economy (Barter & Bebbington, 2009).

Cultural values are indomitably associated with the ways in which people intermingle with their landscapes (Stephenson, 2008). It is often claimed that American cities are far behind in taking climate actions and urban sustainability policies in comparison to European Cities (Beatley, 2000). The more convincing statistics is that per capita energy consumption of motor fuel in American cities is four times the average of the European cities. Decentralized urban metropolis of the United States are more resourcefully served by automobile, while European cities offer the critical mass needed to maintain comparatively high transit ridership (Nivola, 1999). The consumption of fossil fuel results in air pollution, noise, and jeopardizes urban environmental sustainability (Yannas, 2001). However, the American context is fundamentally different such that many great ideas of European cities are not likely to be feasible to administer in American cities. Urban sprawl is very common in American cities, whereas European cities are historically emphasized on compact urban form (Beatley, 2000). In contrast, Bruegmann (2005) argues that if everyone in the world came to live in the same way as the inhabitants of European cities, it will not solve the climate change problem.

Although cities are not affected by global climate policy beyond the jurisdiction of Kyoto protocol, many of them engage in voluntary activities (Sippel, 2004). Both London and New York are coastal cities and are at risk of rising sea level. The synchronization between urban climatologists and planners is essential to improve the awareness and importance of urban climate among policy makers and communities. However, as planning is a political process and not only reliant on scientific facts, the comprehensive planning process needs to be counteracted through improved institutional capacity in the social context of planning (Eliasson, 2000). The desire to show leadership in environmental action with respect to peer cities has also been an impetus for local authorities. For instance, London became a trend-setter in the C40 community believing that it would give fortitude to internal policy commitments to address climate change. Consequently, measures such as congestion charge were introduced to both minimize traffic congestion and improve local air quality. Although the effect in

terms of carbon dioxide emissions reduction may be marginal, the implementation of congestion charge policy in London is often considered to be a successful sustainability strategy which promotes usage of public transportation (Sippel & Jense, 2009).

Cities compete in a variety of ways (Gordon, 1999), and environmental sustainability approach has become a new way of competition between London and New York. According to the global climate model prediction, New York will experience higher temperature, more heat waves in summer, shorter recurrence periods for extreme weather events, such as storms; and increased occurrences of droughts and flooding throughout the 21st Century (Rosenzweig & Solecki, 2001). New York is particularly at risk from climate change because of the urban heat island (Note 2) effect and regional temperature increase (Knowlton et al., 2007). However, New York has already taken several steps to reduce greenhouse gas emissions. On the other hand, the London Ecology Unit has initiated projects, which designated some natural areas as future parks and passive recreation venues (Jim, 2004). As cities seek to reduce greenhouse gas emissions, understanding and learning from model cities may have ascertainable benefits (Kennedy et al., 2009). Both New York and London have diverse population and the concepts of environmental sustainability have been vigorously encompassed by landscape ecology, which emphasizes the preponderance of urban diversity and the reciprocity between fragments of ecological systems (Stephenson, 2008).

Although there is a scarcity of scholarly literature about environmental sustainability in global cities, this paucity is revamped by an abundance of policy documents. The following policy documents have been reviewed for this study.

Table 1. Policy documents of London and New York City

Area	London policy documents	New York policy documents	Major objective(s)
General planning	The London Plan (2008)	PlaNYC 2030 (2007)	General objectives
Energy efficiency	Energy policies phase III (2009)	Inventory of NYC GHG emissions (2007)	Housing standards and renewable energy
Transportation policies	Taking forward Mayor's transport strategy (2012) London congestion pricing: Implications for other cities (2011)	A better way to go (2008)	Reduce car travel and increase public transit
Air pollution	Cleaning the air: The Mayor's air quality strategy (2010)	State of the air (2009)	Less particle emission
Water resource management	Water matters: The Mayor's draft water strategy (2007)	NYC drinking water supply and quality report (2005)	Reduce demand in new developments
Biodiversity and Open Space	The city of London open space strategy (2008)	Open space conservation plan (2006)	Key issues regarding open space
Recycling and waste management	Waste to energy scheme (2009) Future waste arising in London 2010-2031 (2010) Business waste management strategy (2008)	Beyond waste (2010)	Waste treatment and recycling
Green Infrastructure	Sustainable urban infrastructure: London edition – A view to 2025	NYC green Infrastructure plan (2011)	Promotion of green infrastructure
Climate Change	Draft climate change adaptation strategy (2010) Sustainability appraisal report (2010)	GreeNYC (2007) Climate change and a global city (2008) Shrinking the carbon footprint of metropolitan America (2008)	Reduction of emissions

3. Methodologies

Defining sustainability is important for comparative policy analysis of London and New York City. The term “sustainable development” was first used in the book *Limits to Growth* in 1972, and nowadays used more widely in fields such as urban planning and architecture (Wheeler & Beatley, 2004). The United Nations released the Brundtland Commission Report in 1987, which defines sustainable development as “development which meets the needs of the current generation without compromising the ability of future generations to meet their own needs”. However, this definition would be difficult to enumerate for practical applications. It may be regarded as a balance between the mounting demands for environmental protection and economic development. An ethical concern is at the heart of the interest in a sustainable environmental policy, because sustainability implies that the environmental resources have to be shared with future generations (Asheim, Buchholz, & Tungodden, 2001).

Many scholars developed sustainability indicators which cover economic, social and environmental aspects, however, economic and social components so far suggested for inclusion in sustainability indicators have no demonstrated or plausible causal relation to sustainability defined as a production level that does not jeopardize the living conditions of future generations (Hueting & Reinjnders, 2004). Acknowledging that there are no globally accepted indicators of sustainability, some indicators of the Environmental Performance Index (EPI) will be used for this study. The 2008 EPI was introduced by a team of environmental experts led by Daniel Esty at Yale University and Columbia University. The Environmental Performance Index has been constructed on six established policy categories: (i) Environmental Health, (ii) Air Pollution, (iii) Water Resources, (iv) Biodiversity and Habitat, (v) Productive Natural Resources, and (vi) Climate Change (Liu, 2009). However, these indicators are intertwined rather distinctively separated; for example, environmental health is closely related to energy efficiency, air pollution, waste management, open space and transport policies.

The research conducts a comparative environmental sustainability analysis between London and New York. The boundary of the analysis undertaken in this paper is that of the Greater London Area and the five boroughs of New York City. The focus of the study is on city level policies for the reduction of greenhouse gases, specifically with regards to energy usages, transportation, industrial use, household consumption and their adverse consequences in cities. These two cities have been selected using the global city index from the Globalization and World Cities Studies Group and Network (GAWC) (Note 3) where London and New York are the top two global cities based on cities’ network connectivity and integration into the world city network. The local institutional responses to climate change are analyzed. Different qualitative research techniques including content analysis, trend analysis, and case studies are employed here. The quantitative approach has been applied to explore the status of energy consumptions, greenhouse gas emissions and other patterns. This study concentrates on the ecological side of sustainability, covering greenhouse gas emissions, air pollution, water usage and waste management in cities. However, it neither covers every environmental issue such as electromagnetic pollution nor does it examines all social derivatives of sustainability, such as labor rights, human rights, or corporate governance. The sustainability approach of London and New York City are compared in terms of energy efficiency, transportation policies, air pollution level, green infrastructures, recycling and waste management, biodiversity and open space, waste management, and climate change policies of the both cities.

4. Sustainability Initiatives

Widespread environmental degradation and gradual exhaustion of natural resources have been received considerable considerations in academic research and public policy debates in latter part of the twentieth century and the first segment of the twenty-first century. Natural environment functions in a systematic way and any imprudent urban intervention might be horrendous not only for the cities but also for the existence of civilization (Alamar & Murali, 2009). Unrestrained economic growth could be abortive if it endangers environmental safety for the present and future generations (Malik, Rahman, Ansari, Masood, & Grohmann, 2012). Sustainability initiatives are beneficial from economic point of view in conjunction with myriad intrinsic values societies often attributed to nature. Sustainable cities embrace astounding environment, social integration, and just societies in order to uphold stupendous quality of life for citizens within a socio-economic framework that minimizes the venomous impacts of pollution on the local and global environment (Giddings, Hopwood, Mellor, & O’Brien, 2005). It is evident from New York and London that judicious sustainability policy initiatives can acquire ample economic payoffs from attracting and retaining business and creative people in the short and long term (Duerksen & Snyder, 2005). Both cities are emulating environmental planning, policies, and strategies in order to accomplish sustainability goals. In context of global sustainable society, London and New York are reflecting to contribute sustainable development by maintaining the viability of ecological system in perpetuity and seeking best possible environmental practices (Curwell, Deakin, & Lombardi, 2005; Haughton & Hunter, 2003). A plethora of sustainability initiatives has been implemented in both cities, including preferment of renewable

energy and dramatic increase in energy efficiency, well-organized transportation policies, reduction in air pollution, green infrastructures, recycling and reprocess of materials, preserving open space and biodiversity, planning for waste management, and ratifying climate actions.

4.1 Energy Efficiency Policies

New York City is one of the most energy efficient cities in the United States due to its dense population and low automobile dependency (Owen, 2004). However, many respiratory illnesses were evident for the prevalence of concentrated pollution (Corburn, Osleeb, & Porter, 2006). In order to reduce breathing ailments resulting from concentrated environmental pollution, the New York City government enforces purchasing the most energy efficient equipment for city offices and public housing (DePalma, 2005); such as clean air diesel hybrid, compressed natural gas bus fleet, and some first generation energy efficient cars. New York City is one of the leaders in construction of energy-efficient office buildings (Pogrebin, 2006). New York City's prudent energy consumption, high population density, and highest rate of mass transit usage have made New York one of the most energy efficient cities in the United States. Multi-family housing, mixed neighborhoods, preservation of open spaces, and green buildings are also contributing factors. The plan of New York envisioned ensuring all New Yorkers live within a ten minute walk of a park and clear up all contaminated land in New York. The per capita electricity consumption of New Yorkers is less than half of someone who lives in San Francisco and one-quarter the electricity consumed by someone who lives in Dallas (PlaNYC Report, 2007).

Since 1990s New York has introduced a series of environmental policies to cope with growing energy demands. The measures in city's roadway infrastructure includes introducing energy efficient traffic lights and signals and replacing "cobra head" street light with novel energy efficient designs. In public housing projects, more than 180,000 inefficient refrigerators have been replaced with new ones that consume only a quarter of the power of old ones. The city government can procure only the most efficient cars, air conditioners and copy machines according to the law (DePalma, 2005). Wind power delivers 27 million kilowatts of annual electricity demand of the Statue of Liberty and 22 other federal buildings of New York City. In addition, New York City has several clean energy projects and planning for the construction of additional windmills is underway (Williams, 2006).

London is adopting 'be lean, be clean, be green' policies to promote energy efficiency by consuming a smaller amount and renewable energies. London is trying to increase energy efficiency by building partnership between public sectors and businesses and to improve energy efficiency of buildings (Day, Ogumka, & Jones, 2009). The way in which London residents are consuming energy has been changing over last few decades. Devouring less energy, maximizing utilization of the renewable energy and supplying the remaining energy demands efficiently could minimize the consumption of fossil fuel and also reduce the carbon dioxide emissions in London (Mayor of London, 2004). To minimize health risk, London city government is working nationally and locally to create an increasingly environmentally sustainable city by inspiring greater levels of water and energy conservation, and categorizing local pollution hotspot and reduce the pollution levels (City of London, 2010).

4.2 Transportation Policies

New York is different from other American cities because of its extensive public transport system which is used by most of the New Yorkers. It is quite distinctive from many other American cities, because nearly 90% American commute to their workplaces. According to the 2000 US Census, New York is the only city where more than half of the households do not own a car, whereas the national average is only 8%. New York City's public transport serves four times as many passenger miles in Washington, D.C. and Los Angeles metro regions combined. About one in every three users of mass transit in the United States and two-thirds of the nation's rail riders are live in New York and its suburbs (Owen, 2004). Only 14% trips to the Central Business District (CBD) and only 6% shopping trips of the New York City are by car (White, 2006). New Yorkers' overwhelming usage of transit has saved 1.8 billion gallons of oil in 2006 which is half of all the oil saved by transit nationwide, consequently 11.8 metric tons of carbon dioxide pollution was kept out of the air (Baxandall, Dutzik, & Hoen, 2008). Although New York is well ahead in sustainable transport within the United States, London's approaches are more conspicuous. More than 250,000 vehicles enter into the 8.5-square-mile heart of Manhattan in three hours each morning in New York, approximately the equal number that come in the 8 square miles of central London in a whole workday (Blatt, 2005).

Traffic congestion is a hard-to-escape and common problem in big cities (Baigabulova, 2010). In addition to having a standard bus system, London has employed strategies to reduce traffic and parking in the center city for decades. Congestion pricing is an efficient instrument to reduce traffic and successively traffic in the central city has declined. The percentage of people who use their cars daily dropped from 38% to 19% within four years. In Contrast, New York City did not get approval by the state legislature in attempt to apply congestion price

because it was removed from the larger context of transportation planning. New York congestion pricing was ineffectual because it was not part of a larger long-term strategy for traffic management while London implemented this strategy with success. For New York, congestion pricing would be a major shift in policy, not an incremental change, and therefore would have required more extended discussions and debates than the Mayor anticipated. The Mayor of London had a well-established authority to implement congestion pricing without approval from higher level of government, whereas, city and state legislative approval is required in New York City. The initiative failed in New York because City Hall failed to leave room in the process for input from constituent groups and some important political leaders in the state until it was too late (Angotti, 2008).

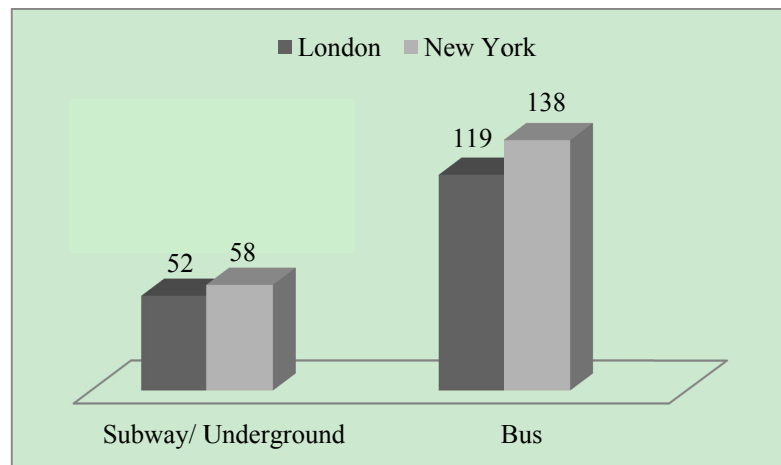


Figure 1. CO₂ Emissions (in gram per passenger per kilometer) in 2005

In 2005, an annual CO₂ emission from transport in London is 12.1 Mt which is 26% of the total emissions of the city. Cars and taxis (both black cabs and minicabs) are the most carbon dioxide intensive transportation in London, emitting 151g and 192g of CO₂ per passenger per kilometer respectively. Still, emissions of these vehicles in New York are far higher (238g and 322g respectively). This is due to variances in fuel efficiency and a little higher number of passengers per vehicle in London. In addition, public transport of London is far more carbon dioxide efficient, as it produces only 52g of CO₂ per passenger kilometer for underground and 119g for buses. New York's CO₂ emission is slightly higher, 58g of CO₂ per passenger kilometer for Subway and 138g for buses (Watson, 2008).

4.3 Air Pollution

Air pollution is a major problem for New York City, and residents of Manhattan are among the highest risk in the country of developing cancer from chemicals in the air (National-Scale Air Toxics Assessment [NATA], 2011). New York ranked 22nd of the 25 regions in the United States most affected by particle pollution, 17th of the 25 most ozone polluted cities (American Lung Association, 2009). The city has taken initiatives to curb pollution with measures like fitting catalytic converters to the exhausts of diesel driven city buses. New York has the largest hybrid bus fleet in the United States. Since 2005 city owned vehicles, including personal cars of the city officials are required to be fuel efficient hybrid vehicles that emit minimal particles and carbon dioxide. The Department of Sanitation is also working with truck manufacturers to introduce gas electric hybrid garbage trucks.

London is committed to achieve a 60% reduction of its carbon dioxide by 2025 and to ensure 25% of London's energy is delivered through more efficient decentralized energy by 2025. London planned to ensure environmental and economic benefits of making London a low carbon city by improving energy efficiency of London's homes and buildings and reducing emissions from homes, buildings and transport (London Assembly, 2009). The Mayor of London has already delivered policies for making the air cleaner by offering people alternatives to car and proposing a comprehensive package of measures to improve London's air quality in accordance with EU targets. The Mayor determined to establish London as one of the cleanest, and greenest cities in the world as well as financing significant amount of monetary incentives to increase cycling, amplification of 'smarter travel' measures, prompting the uptake of electric vehicles, and transforming London's bus fleet to low emission or hybrid (Mayor of London, 2010a).

4.4 Water Resource Management

The water consumption in London is relatively low compared to New York (Watson, 2008). However, pressure on London's water resources is growing fast, subsequently there is an estimated deficit of 200 million liters a day during a dry day. Climate change as well as an increasing population is expected to add to pressure on water supply and water resources in the longer term. A considerable amount of water is lost from London's water supply network on a daily basis because of the existence of damaged pipes. The existence of damaged pipes is due to the aging infrastructure of London. Climate change is predicted to increase the risk of tidal flooding, river flooding, localized flooding, groundwater and sewer flooding in London (Mayor of London, 2010b). Unlike New York, many of London's reservoirs lie within the precincts of the metropolitan area (Hunt, 2005).

New York City has developed one of the best municipal water supplies in the world in terms of quality, reliability, and innovative management that provides 9 million people with 1.3 billion gallons of potable water (Perlman & Milder, 2004). In the case of New York, the City's Department of Environmental Protection is responsible for its water supply system. New York City's drinking water is supplied from the protected Catskill Mountains watershed which is pure enough that no water treatment plant is required (Bloomberg & Lloyd, 2005). The water supply system consists of watersheds up to 120 miles north of New York City. The New York City Department of Environment Protection has established a Climate Change Task Force to support institutional decision making in light of sustainability, because of uncertainties about how climate change will affect New York City's water supply and wastewater treatment systems. These concerns intensified by the effects of Hurricanes Katrina, and Sandy. The Climate Change Task Force is addressing a range of climate risks, including sea level rise, increased temperatures, and higher occurrences of extreme weather events, and altered precipitation patterns that have an impact on the City's water supply and wastewater treatment systems. London city administration wants to warrant that London can learn from exemplary sustainability practice in major international cities including New York City through global partnership (London Climate Change Partnership, 2006).

4.5 Biodiversity and Open Space Provisions

Global warming lead to higher average temperature and heat waves, which can lead to reduced oxygen levels in rivers and consequently affect aquatic biodiversity. London has an abundance of natural amenities, including parks, canals and rivers and private green space such as gardens, as well as rich and diverse architectural heritage. However, rapid development processes in London have created pressures on London's existing natural environment, and deteriorated water quality, biodiversity, as well as the air quality. The City of London also maintained around two hundred smaller areas of Open Space, including secret gardens, churchyards, plazas and highway planting. Global warming is projected to increase pressure on London's physical environment in the long term, whereas, the noise disturbance is an ongoing issue (Mayor of London, 2010c).

New York has also a long tradition of conserving and managing open space, natural, historical and recreational resources for its inhabitants. The natural landscapes, urban parks and historic resources shape New Yorkers' way of life as well as strengthen the economy. However, the parks, forests, waters and wetlands are vulnerable to human intervention and climate change (Pataki, 2006). As an innovative approach, the Council on the Environment of New York City has established the Greenmarket program, an open-air market in the city, to provide small family farmers opportunities to sell their fruits, vegetables and other farmhouse products. More than one hundred New York City restaurants collect their ingredients from 45 Greenmarkets; and Greenmarket farmers also donate about 500,000 pounds of food to different hunger relief organizations each year (Shapiro, 2008).

4.6 Recycling and Waste Management

When Mayor Rudolph Giuliani closed the landfill on Staten Island in 1999, the city did not have an effective plan for garbage disposal, and most of the city's garbage was trucked out to the landfills of other states. As a result an unacceptable amount of truck traffic was generated in low-income neighborhoods and exacerbated the air pollution. Later Mayor Michael Bloomberg enacted legislation establishing a new solid waste management plan in 2006, which employs barges and trains to export 90% of the city's daily garbage. The plan was supported by the environmentalists and social activists, because it ensured environmental justice and neighborhoods would not bear the disproportionate burden under the proposal (New York State Department of Environmental Conservation, 2010). Due to global warming, higher temperature may also have negative effects on waste management. For instance, deleterious impacts on waste infrastructure are predictable because of the potential increase in volume of municipal waste. Inadequate planning for future waste management could possibly spread diseases and pandemics.

London produces about 22 million tons of waste per year. In per capita terms, London produces approximately 600 kg of municipal waste per person, which is less than New York (Watson, 2008). Like New York, most of this waste is taken outside of the city into landfill sites. The recycling process is also discouraging, only 22 percent of London's municipal waste is recycled. It is definitely not a sustainable strategy, however, London is taking promising initiatives. For example, London is converting the city's non-recyclable waste to energy and heat through non-thermal technology, anaerobic digestion, mechanical biological treatment or thermal technologies including pyrolysis and gasification (London Assembly, 2009). Recently, the Corporation of London announced the Clean City Awards Scheme to improve partnership with businesses in order to accomplish a clean environment through comprehensive waste management (Mega, 2010b).

4.7 Green Infrastructure

New York was a slow starter in the green building movement. After the Second World War, there was a construction boom in New York City and the city changed its zoning regulations. Widespread usage of air conditioning enabled sealed glass design of steel towers without much provisioning for light and ventilation, and consequently such buildings required large amounts of fossil fuels to operate. In later decades, the building style changed rapidly toward energy efficient buildings. For example, around 3,000 new green apartments have been built since 2001. One of the reasons behind this transformation is that the State of New York introduced a green tax credit for the first time in the United States in 2000 (Bloomberg & Strickland, 2011). In 1999 the city's Department of Design and Construction developed certain guidelines in order to encourage environmentally sound building methods according to the standards set by Leadership in Energy and Environmental Design (LEED) for efficient energy and water consumption, better quality of indoor air and usage of renewable materials. Such regulations are also applicable to private constructions which receive \$10 million or more public funds, or half of whose budget comes from public money (Radoff, 2004). In recent years, New York City has shown its growing commitment to integrate environmental factors into urban architecture (Mega, 2010a).

The infrastructure of London is not much promising, because most of London's CO₂ is emitted from its buildings. The annual per capita CO₂ emissions from these buildings was 4.3 tons in 2005, against 4.8 tons in New York. The total energy used within London's residential, commercial, public and industrial buildings was responsible for 34.9 Mt of CO₂ in 2005 which is nearly three-quarters of London's total carbon emissions. It exemplifies 4.7 ton per person, or 100 kg of CO₂ for every square meter of building space. In comparison with New York, London has higher carbon intensity and consumes more energy per square meter in residences and workplaces. However, a more precise comparison would require consideration of the differences in temperature between the two cities. Relative to London, New York has far more Heating Degree Days (HDD) (Watson, 2008).

4.8 Climate Change Policies

Certain parts of New York City are at risk if current global warming patterns continue and sea levels rise. The city is managing flood risks at Staten Island by Bluebelt program which provides storm water detention ponds, and creates or enhances streams, ponds and wetlands. As a result of impermeability of urban areas and insufficiency of the surface water sewer network, there are substantial numbers of combined sewer overflows into the Thames. Since London is experiencing frequent flash flooding during heavy rainfall and has existing problems with storm water management, the city is planning to replicate the Bluebelt program from New York (London Climate Change Partnership, 2006).

Both London and New York have intensified their efforts to combat climate change in recent years. While London made the earlier moves toward creating a "green" capital, New York redoubled its effort by releasing PlaNYC in 2007 which is an aggressive program to vastly improve New York City's environmental sustainability by 2030. The 2005 report by Climate Group ranked London as the 11th best city and New York as 14th among fifteen major cities which have taken initiatives to curtail carbon dioxide emissions. London's Climate action plan has demonstrated clear vision, concrete targets, and bold leadership. The creation of London Climate Change agency in 2005 was a judicious step which led the city toward preparing strong legislation to reduce the impact of London on the climate and deliver innovative ways to achieve energy efficiency through different renewable energy projects all over the city area (Mega, 2010a). London is the first city in Britain to set itself statutory carbon dioxide emissions reduction targets 20% by 2015 and 60% by 2025 below 1990 baseline (Watson, 2008). London led the establishment of C40 group to cope with climate change in major world cities.

PlaNYC report aimed at planning the city's environmental future up to 2030. The report acknowledged that climate change is set to affect New York City more than the rest of the region because of the 'urban heat island effect', which means the city is often four to seven degrees Fahrenheit warmer than the surrounding suburbs. In addition, the report recognizes the responsibility of New York to 'rise to the definitive challenge of the 21st

century', because the City released 58.3 million metric tons of carbon dioxide in the atmosphere only in 2005. New York City's PlaNYC for the first time puts long-term sustainability on New York City's policy agenda. The environment of New York is affected by the city's size, density, substantial mass transportation infrastructure and proximity to the Hudson River. However the population density has both benefits and problems. As of 2009, greenhouse gas emission of New York is 7.1 metric tons per person per year, well below the national average of 24.5 metric tons (Owen, 2009). In addition, although New York City is providing 2.7% of the population of the United States, it responsible for only 1% of national greenhouse gas emissions (PlaNYC, 2007). The greenhouse gas emissions for air and marine travel usually reflect each city's gateway status, especially for global cities. London has the highest emissions for air transport at 3.12 t eCO₂/cap; and the emissions from New York City is not far behind (Kennedy, et al., 2009).

5. Comparative Analysis and Discussions

As global cities are the financial centers of globalized economy, they have attained much attention from global communities to take initiatives on environmental sustainability and fight against climate change. As a result global cities have become places showing commitment to urban environmental sustainability (Lee, 2009). The low carbon footprint and extensive public transportation system of New York City make it more sustainable than many cities in the United States. New York's economy is large enough and so has such a big influence on national policies that environmental groups make large efforts to shape legislation in New York City. Michael Bloomberg, the Mayor of New York, has signed the U.S Mayors Climate Protection Agreement, along with 248 other mayors in order to conform to the Kyoto protocol within their own territory. New York has also launched the GreeNYC marketing campaign in an effort to involve people in carbon emission reductions.

Table 2. Target of greenhouse gas emissions for London and New York City (Note 4)

City	Targeted GHGs	Reduction target and target year	Base year GHG level	Estimated GHG Level for target year (BAU scenario) (Note 5)	Emission reduction to be achieved, calculated for the target year	Annual reductions over the plan time frame (as % of the base year)
London	CO ₂	20% (2016) 60% (2025)	1990: 45.1 MtCO ₂	2025 BAU: 51 MtCO ₂ (+15%)	33 MtCO ₂	2.1%
New York	CO ₂ , CH ₄ , N ₂ O	30% (2030)	2005: 63.1 MtCO ₂ e	2030 BAU: 80.1 MtCO ₂ e (+27%)	36 MtCO ₂ e	2.3%

New York is determined to close the environmental gap between itself and London in coming years. It might be due to London's pioneering philosophy toward combating climate change which sets it apart from New York. In contrast, London is very enthusiastic to remain at the forefront of international climate research and the Mayor Boris Johnson has pledged his commitment to maintaining London's role as a global leader in the combat against climate change. The first step to tackle climate change is to accepting its reality and consequences. Investment in new technologies and scientific and technical research facilities are important for the solutions of the future.

Challenges remain for London and New York, for example, the potential impact of flooding and rising sea levels. The flooding of Thames beyond the Barrier, and flooding of New York City's subway system are the concerns to which both cities must now turn their attention. In New York City, all seven of the tunnels under the East River were flooded by Hurricane Sandy, many of which provide critical connections between Lower Manhattan and Brooklyn (Flegenheimer, 2012). Since the introduction of congestion charge scheme and the UK's ratification of the Kyoto protocol, London is increasingly thought of as a "greener" city than New York. However, the PlaNYC has addressed New York's environmental issues to build up New York as a greener city (Clark, 2008). London developed a sustainability plan in response to the 1999 European Spatial Development Perspective calling on European Cities to focus on sustainability and the plan was released in 2004. As a sustainable development strategy, the London Plan explicitly prioritizes social inclusion and reduction of gap between rich and poor. It makes the London Plan very different from PlaNYC which fails to address equity issues. In PlaNYC, there is no discussion of race and economic disadvantage while New York is one of the most segregated cities in the United States and it has over a million people requiring some form of food assistance (Angotti, 2008).

The comparative analysis reveals that there are more similarities than differences between London and New York City in their sustainability objectives. The goals of both cities are to create a more sustainable environment, however, the difference in approaches are mainly caused by differences in geography, local cultures, and environmental politics of the cities. In order to ensure energy efficiency New York City's main policy objectives focus on energy efficient buildings, and fuel efficient cars; whereas London is leading in using renewable energies, and creating public private partnerships and energy conservations. Both cities have concentrated population and low automobile dependency. In transportation policies, New York is one of the foremost cities in the United States because of the compactness of the city, mix design development, and an extensive metro system. However, London is leading in the transportation policies, because London has successfully introduced congestion pricing and the CO₂ emissions per passenger per kilometer is slightly lower in London. The experience of London suggests that a combination of aggressive pricing, land use management, and improved transit can significantly reduce driving (Sperling & Gordon, 2009). Both cities have shown equal commitments to reduce air pollution levels to ensure better environmental health for their citizens. The water consumption in London is relatively low compared to New York. Both cities are taking long-term planning for water resource managements in light of the increasing frequencies of extreme weather events. New York City and London also have a long tradition of conserving and managing open spaces, natural, and historical amenities for their citizens. In addition, the urban centers of London and New York have large parks (Esparza & McPherson, 2009). In recycling and sustainable waste management strategy, as well as building green infrastructure both cities need to take more auspicious initiatives. While London made the earlier moves toward adoption of sustainability policies, New York redoubled its effort by developing a plan as the first megacity to reduce greenhouse emissions by 30 percent before 2030 (Newman & Jennings, 2008). Both New York City and London are converging in creation of greener cities by adoption of concomitant environmental sustainable strategies.

6. Conclusion

Environmental politics has always played as a key determinant of sustainability initiatives of London and New York City. Sustainability policies become important to the politicians only when the issue can captures voters' attention. It happens after severe disasters, catastrophes and natural extreme events. Politicians might be expected to endorse policies in response to the preferences of majority of voters instead of caring for minorities. Voters care more about short term development, such as creation of jobs instead of long-term environmental sustainability unless severe environmental problems knocking at their doors (Kirchgässner & Schneider, 2003). However, over last decades, there is an increasing sensitivity of inhabitants of New York City toward sustainable environment aftermath Hurricanes Katrina, Irene, and Sandy. Even after the withdrawal of the United States from the Kyoto protocol in 2001, New York declared its approval to the commitments against global warming. Environmental hazards have also played an important role in London's planning and policy processes (Hunt, 2005). Politicians often choose bundle of policies which is easily understandable by the voters and serve the interest of well-organized lobbies. The macroeconomic benefits of long-term sustainability policies are difficult to understand at voters' level, this is why elected representatives are occasionally skeptical about sustainability actions (Healy & Malhotra, 2009). Although London and New York have taken many sustainability initiatives, it is clear that intergenerational sustainable development is not the primary goal. In most cases, environmental actions are the bi-products of programs and policies to solve many other contemporary observable problems, such as reducing air pollution, saving money, ensuring quality of community life, enhancing alternative transportation. Despite political turmoil over environmental policies, sustainability initiatives of London and New York City are reasonably impressive.

The comparative study reveals that both London and New York City have taken enormous measures to ensure sustainability of the cities. Despite differences in cultural backgrounds as well as regional and national distinctness, both cities have shown more convergence than divergence in sustainability initiatives. At the same time, New York and London are facing ongoing challenges, especially from the air pollution and congestion point of view. Global cities are specialized node points in global economic system, and have direct and tangible effect on global affairs through socio-economic means (Sassen, 2001). Although globalization brings outstanding wealth and opportunities for global cities, there are also enormous environmental challenges, because historical tendency has been to promote the development of cities at the cost of natural destruction. The term "urbanization" means both the movement of people to cities and transformation of natural land-cover into urban land-cover (Mills, 2007). Such transformations are making environment vulnerable to not only to the rare species but also to the disadvantaged population of cities. The cities are always denounced for generating world's most greenhouse gases. In cities, there are many good examples in energy use in transport, principally through demand management, including parking and access control, congestion charging. Ultimately behavioral

change of city dwellers is essential for implementing different policies at the city level. Both cities, London and New York are taking intensive initiatives to ensure environmental sustainability and these approaches indicate that they are concurring toward a sustainable environment. As London and New York City have numerous examples of good practice, they should compare each other's policies to attract energy technologies and sustainable development. However, the complexity of sustainability agenda makes it difficult to address this issue only through regulations and planning. Residents, businesses, governments, developers, and employers of London and New York City have to work together to achieve long-term sustainability goals. Mayors of London and New York City, along with other prominent figures of public and private institutions of the cities, could lead to materialization of important global networks to achieve sustainable development goals.

Acknowledgements

I would like to gratefully thank Dr. David M. Simpson for his support in writing this article. I would also like to sincerely thank Dr. Hank V. Savitch for his insightful comments on earlier draft of this work. Finally, I would like to thank three anonymous reviewers and the editor at the Journal of Sustainable Development for their thoughtful criticism in revising the paper.

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Notes

Note 1. The Environmental Kuznets Curve is a hypothesized relationship between various indicators of environmental degradation and income per capita. In the early stages of economic growth, environmental degradation and pollution increase, but beyond some level of income per capita (which will vary for different indicators) the trend reverses, so that at high-income levels economic growth leads to environmental improvement. This implies that the environmental impact indicator is an inverted U-shaped function of income per capita.

Note 2. An Urban Heat Island (UHI) is a metropolitan area which is significantly warmer than its surrounding rural areas.

Note 3. The first attempt to define, categorize, and rank global cities using 'relational data' was made in 1998 by Jon Beaverstock, Richard G Smith and Peter Taylor, who all worked at that time at Loughborough University in the United Kingdom. Together they established the Globalization and World Cities Research Network. This ranking generally denotes cities in which there are offices of certain multinational corporations providing financial and consulting services rather than denoting other cultural, political, and economic centers.

Note 4. Please see Croci, Melandri, and Molteni (2010).

Note 5. Business As Usual (BAU) scenarios are estimates on how future GHG emissions would unfold if no additional measures, other than those that would naturally occur or already conceived, were implemented.