



ADAPTING TO CLIMATE CHANGE IN NEW YORK CITY AND REGULATORY BACKGROUND¹

NEW YORK'UN İKLİM DEĞİŞİKLİĞİNE UYUMU VE DÜZENLEYİCİ ARKA PLANI

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ABSTRACT

The catastrophic effects of climate change can be seen in New York City (“NYC”) today. As of now, the NYC as a coastal city has faced different climate risks such as heat waves and storm surges, which affect everyday life citywide, and, if current trends continue, they will become more frequent and severe. Hurricane Sandy which has devastated the East Coast is just the latest example. To strengthen its resilience, the NYC Administration comes forward particularly in this regard to commissioning expert scientific advice, formulating policy goals, setting standards and developing new institutions for environmental governance and sustainability. Locally, through PlaNYC, the City’s sustainability plan, the NYC Administration has pursued several initiatives to reduce greenhouse gas (GHG) emissions, with mostly 30 percent below current levels by 2030. Since 2002, the Administration stands out challenging climate change and its initiatives which are the examples of best practices at the municipal

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level. In this framework, this study describes the comprehensive effort to reduce GHG emissions, as well as provides NYC's climate change projections and some of the potential risks to the NYC's critical infrastructure posed by climate change. Also local legal documents determining the City's climate policy and offering significant opportunities for implementation is examined.

Keywords: Climate Change, New York City, PlaNYC, Regulatory Background.

ÖZ

Bugün New York kentinde iklim değişikliğinin yıkıcı etkileri görülmektedir. Bir kıyı kenti olarak New York, artık günlük yaşamı etkileyen sıcak hava dalgaları ve fırtınalar gibi farklı iklim (değişikliği) riskleriyle yüz yüze kalmakta ve bunlar, eğer mevcut eğilimler devam edecek olursa, daha sık ve şiddetli olacaktır. Doğu kıyısına zarar veren Sandy Kasırgası, verilebilecek en son örneğidir. Kentin (dayanıklılığını) güçlendirmek için New York Kent Yönetimi, özellikle uzman bilim komitesinin oluşturulması, siyasi hedeflerinin belirlenmesi, ölçütlerin geliştirilmesi ve çevresel yönetim ve sürdürülebilirlik için yeni kurumların oluşturulması konularını öne çıkarmaktadır. Kentin sürdürülebilirlik planı olan PlaNYC aracılığıyla, New York Kent Yönetimi, yerelde 2030 yılına kadar sera gazı emisyonunu mevcut düzeyinden yüzde 30'un aşısına çekebilmek amacıyla çeşitli girişimlerde bulunmaktadır. 2002 yılından bu yana, söz konusu yönetim, iklim değişikliğiyle mücadelede ve kendisinin belediye düzeyinde en iyi uygulama örnekleri olarak girişimleriyle göze çarpmaktadır. Bu çerçevede, bu çalışma, kentin iklim değişikliğine (ilişkin) varsayımlarını ve bundan olumsuz etkilenen kentin hassas altyapısına (ilişkin) bazı potansiyel tehlikeleri ele almasının yanı sıra, sera gazı emisyonlarının azaltımı konusundaki kapsamlı çabayı açıklamaktadır. Ayrıca kentin iklim politikasını belirleyen ve (bu politikaların) uygulanması için önemli fırsatlar sunan yerel yasal belgeleri incelenmektedir.

Anahtar Kelimeler: İklim Değişikliği, New York, PlaNYC, Düzenleyici Arka Plan.

INTRODUCTION

One of New York City's ("NYC") best practices for tackling climate change and the creating sustainable city is the NYC administration and its applications. The Administration comes forward particularly in this regard to commissioning expert scientific advice, formulating policy goals, setting standards and developing new institutions for environmental governance and sustainability (Corburn, 2009: 413), although the City faces as a result of more frequent heavy precipitation, sea level rise and rising temperatures which are climate change-related challenges. Hurricane Sandy, which occurred in October of 2012, can be an important touchstone for that and also, is a clear example for need to tackle climate change. Because this Hurricane struck and swept through the Caribbean and up the East Coast of the nation, it was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season, besides the second-costliest hurricane in the nation history. It affected 24 states, including the entire eastern seaboard from Florida to Maine and west across the Appalachian Mountains to Michigan and Wisconsin, with especially severe damage in New Jersey and New York, and caused the death of hundreds of people. Its storm surge hit NYC, flooding streets, tunnels and subway lines and cutting power in and around the city. In affected region, over 7,000 transformers and 15,200 poles were damaged and fuel pumps at gas stations did not work due to power outages and lack of back-up generation (U.S. Department of Energy, 2013: 6; Pereira, 2013: 6; Winski, 2013: 15). It caused large financial losses; over \$50 billion in damage in the nation, total surpassed only by Hurricane Katrina. Hurricane Sandy is the nation's most expensive storm since Hurricane Katrina, which caused \$128 billion in damage, according to the 2013 data (DoSomething.Org, <http://www.dosomething.org>, last visited: 06.12.2013; National Climatic Data Center, <http://www.ncdc.noaa.gov>, last visited: 06.02.2013), and this mainly will be paid by federal funds, but many other tax bills will reflect to the public (Freedman-Schnapp, <http://21c4all.org/sites>, last visited: 08.16.2013). Despite all this, the author believes the NYC Administration was protected from the possible more adverse results because of the measures taken to increase the NYC's resilience to extreme weathers.

Our study examines policies and programs related to GHG emissions arising in NYC within the scope of the efforts local governments to ensure urban sustainability against the climate change. This study shows how the NYC's climate policy developed in the context of a comprehensive long-term sustainability plan and model, which is PlaNYC, since 2002. The NYC Administration stands out in challenging climate change, and its initiatives are the examples of best practices at the municipal level. In this framework, our study consists of three sections. The first section discusses NYC's administrative

structure in the light of current studies. This section also provides climate change projections for NYC and identifies some of the potential risks to the city's critical infrastructure posed by climate change. In the second section, NYC's policies and measures for the realization of goals set for its GHG emissions reduction are analyzed. In the third and final section, local legal documents determining the City's climate policy and offering significant opportunities for implementation is examined.

1. OBSERVED TRENDS FOR TEMPERATURE, PRECIPITATION SEA LEVEL RISE AND EXTREME EVENTS IN NEW YORK CITY

NYC has a temperate and continental climate, along with hot and humid summers and cold winters. An annual average air temperature from 1971 to 2000 was approximately 55 degrees Fahrenheit, according to the records. Its climate is depicted by substantial precipitation amounts range between approximately 43 and 50 inches in all months of the year. (NYC.gov, <http://www.nyc.gov>, last visited: 06.13.2013) However the trends in temperature, precipitation and sea levels have risen overall throughout the century, despite of interannual and decadal variations. Observational records show that spring is arriving sooner, summers are growing hotter, and winters are becoming warmer and less snowy. NYC's mean annual temperature and precipitation increased, respectively, 4.4 °F and 7.7 inches from 1900 to 2011. Moreover, a long and intense heat wave during the summer of 2006 caused 40 heat stroke deaths, most of them elderly, in NYC, according to a report (NYC Health, <http://www.nyc.gov>, last visited: 11.11.2015). NPCC2' 2013 report update finds that mean annual temperatures and precipitation are, in turn, projected by global climate models to increase by 2.0 – 3.0°F and 0 – 10 percent by next seven year (New York City Panel on Climate Change (NPCC2), 2013: 4). Sea level in a large fraction of NYC and the surrounding region has also risen 1.1 feet due to land subsidence, with the remaining sea level rise driven by climate-related factors since 1900 and infrastructure in these areas is vulnerable to coastal flooding during major storm events from inland flooding and coastal storm surges (NYC. Gov, <http://www.nyc.gov>, last visited: 06.13.2013). It is not definite due to high natural variability and limited record length (Horton et al., 2011: 2252), but this sea level rise occurring over time increased the extent and the magnitude of coastal flooding during storms. Several previous studies (U.S. Department of Energy, 2013; National Climate Assessment and Development Advisory Committee, 2013; Intergovernmental Panel on Climate Change, *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*; National Oceanic and Atmospheric Administration, 2012; Sallenger et al., 2012: 884-888; Smith and Katz, 2013: 387-410) have also confirmed the claim that sea levels continue to rise globally,

along with higher local rates of rise in the Northeast U.S. during this century and therefore, NYC can expect dramatic changes in climate over the course of this century, with significant impacts on the NYC's economy, environment and quality of life. All observed climate information and trends poses significant risks to NYC's communities and infrastructure.

Hurricanes and tropical storms are rare in NYC, but they are always possible and do in fact occur with long-term frequency. This is because the history of hurricanes in NYC is a very old and hurricanes have affected NYC since the 17th century. The greatest and deadliest storm, known as the Long Island Express, was the 1938 New England Hurricane, which struck over Long Island and into New England as a Category 3 hurricane, killing nearly 200 people. This storm led to millions of dollars in damage, and its floods knocked out electrical power in all areas above 59th Street in Manhattan and in all of the Bronx, the new IND subway line lost power, and 100 large trees in Central Park were destroyed. The other major storms in the past are 1821 Hurricane which was one of the only hurricanes believed to have passed directly over parts of modern NYC; Hurricane Carol in 1954 which was the destructive hurricane that hit the Northeast coast as a Category 3 hurricane over Long Island, New York and Connecticut on the 31st of August; Hurricane Agnes in June 1972 which was responsible for 122 deaths and \$2.1 billion in damage in the U.S.; Hurricane Gloria in September 1985 resulted in extensive damage; Hurricane Floyd in September 1999 which caused the majority of the \$3 to 6 billion in damage; Hurricane Irene in August 2011 led to the major damage was caused by flooding the City's upstate water supply system; and Hurricane Sandy in late October 2012. (NYC.gov, <http://www.nyc.gov>, last visited: 06.20.2013) By now it is clear that these hurricanes hit NYC very infrequently and high-intensity, mostly between July and October. But NYC is also vulnerable to sea level rise, which may lead to a marked increase in extreme flood levels in the long-term. (Lin *et al.*, 2010) Therefore, especially Hurricane Sandy has taken attention on the effects that such extreme climate events have on NYC, reminding and showing New Yorkers that the city is vulnerable to be a range of uncertain and potentially climate hazards today and in the future. Moreover, a new report which released in July 2013 (U.S. Department of Energy, 2013: A-10) explains that a coastal flooding resulting from accelerating sea level rise and storm surge is projected to occur 10 times as often by 2100. By 2050, these effects on NYC could be even more severe than previously thought, putting more people at risk from increasingly frequent, intense, and longer heat waves in duration and coastal floods in frequency, extent, and height as a result of increased sea levels due to extreme events (New York City Panel on Climate Change, 2013), and approximately 43 miles of NYC's coastline which stretches a total of 520 miles – 8 percent of the city's total excluding beaches and wetlands – could be at risk

daily or weekly tidal inundation during non-storm conditions (PlaNYC, <http://nytelecom.vo.llnwd.net>, last visited: 07.15.2013: 46).

2. CLIMATE CHANGE ADAPTATION AS A CHALLENGE AND OPPORTUNITY FOR NEW YORK CITY

New York City's Office of Long-Term Planning and Sustainability (OLTPS) formed as part of the Mayor's Office by the Bloomberg administration in 2006. The Office, as a comprehensive and important step toward climate change adaptation, launched a report titled PlaNYC (NYC.gov, <http://nytelecom.vo.llnwd.net>, last visited: 07.03.2013) after one year. PlaNYC was a comprehensive and long-term sustainability plan comprised of 127 initiatives in the key areas of land, water, transportation, energy, air and climate change. Since then, the plan was updated in 2011 and has been expanded to 132 initiatives and more than 400 specific milestones to prepare the city for one million more residents, strengthen the economy, combat climate change, and enhance the quality of life for all New Yorkers for December 2013. (NYC.gov, <http://nytelecom.vo.llnwd.net>, last visited: 07.03.2013) The Office has accepted that the challenges related to climate change are a part of sustainable development goals.

Under the umbrella of NYC's sustainability plan, PlaNYC, the Bloomberg administration has carried out a wide range of innovative initiatives, including the Greener Greater Buildings Plan, Clean Heat Program, Million Trees program, Green Infrastructure Plan, and the others to increase NYC's resilience to the effects of climate change during the this time. NYC is becoming more energy efficient with these initiatives. For example, only as more buildings comply with the GGBP and as the code proposals of the NYC Green Codes Task Force are fully enacted, it is expected that these efficiency gains would increase, and could yield more than a 10 percent GHG emissions reduction by 2030. This success has largely based on improvements in the NYC's energy supply changes. According to 2013 data, NYC's annual GHG emissions over 2005 emissions have dropped 16 percent - more than halfway to its goal of a 30 percent reduction by 2030. For this, the Bloomberg administration has spent 10 percent of their annual energy budget - approximately \$80 million - on funding energy efficiency measures in city government buildings so far. (NYC.gov, <http://nytelecom.vo.llnwd.net>, last visited: 07.03.2013) A recent proposal from the Bloomberg administration for NYC alone is priced at \$20 billion (New York Times, <http://www.nytimes.com>, last visited: 07.03.2013).

The Greener, Greater Buildings Plan

NYC's buildings account for about 75 percent of carbon emissions. They are the largest single source of energy use and emissions (Brokhof *et al.*, 2011: 20), and this leads to \$15 million per year in energy costs. The city has 22,000 buildings, which are mostly concentrated in Manhattan, over 50,000 square feet, according to the records. To reduce energy consumption and make the energy systems of the city cleaner and more reliable, NYC enacted the Greener, Greater Buildings Plan (GGBP) legislative package in December 2009 (Millan, <http://www.facilitiesnet.com>, last visited: 07.09.2013).

By 2030, this comprehensive plan to improve energy-efficiency in existing buildings is estimated to reduce citywide GHG emissions from new and existing buildings by at least 5.3 percent (<http://www.urbangreencouncil.org>, last visited: 07.05.2013), have a net savings of \$7 billion, and create roughly 17,800 construction-related jobs over 10 years (NYC.gov, <http://www.nyc.gov>, last visited: 07.08.2013). GGBP was developed together with PlaNYC (Brokhof *et al.*, 2011: 5), and has been implemented successfully. This is because, by August 2011, almost two-thirds of covered buildings had complied in the framework GGBP (Brokhof *et al.*, 2011: 15). For this, NYC is also applied to use \$16 million of the \$80 million in Federal stimulus funding allocated to the city under the program of Energy Efficiency and Conservation Block Grant for this direct lending program (The Sallan Foundation, <http://sallan.org>, last visited: 11.16.2015). Lastly, the NYC Building Resiliency Task Force released the report which has a wide range of proposals for making NYC buildings and residents safer and better prepared for the next extreme weather event on June 27, 2013 (Urban Green Council, 2013).

NYC Clean Heat Program

NYC Clean Heat Program provides free resources to help buildings with technical assistance and financing options convert to the cleanest heating fuels – including natural gas and biodiesel (See for the alternatives fuels; NYC.gov, <http://nyccleanheat.org>, last visited: 08.22.2013) – from heavy heating no. 6 and no. 4 oil more quickly, beginning in July 2012. NYC Department of Environmental Protection passed the relevant regulations in April 2011. PlaNYC's goal is to reduce 2 percent of NYC's emissions, about 1.3 million metric tons, by the end of 2013 through this Program (NYC.gov, <http://nytelecom.vo.llnwd.net>, last visited: 07.03.2013; NYC Clean Heat, <http://www.nyccleanheat.org/>, last visited: 11.16.2015). Achieving this goal will also help to improve air quality and save lives. NYC's air pollution leads to nearly 6 percent of annual deaths each year (New York City Department of Health and Mental Hygiene, <http://www.nyc.gov>, last visited: 07.10.2013). For

this program, NYC launched more than \$100 million in financing to encourage buildings to convert to cleaner heating fuel in June 2012 (NYC.gov, <http://www.nyc.gov>, last visited: 07.10.2013).

MillionTreesNYC: A PlaNYC initiative with NYC parks and New York restoration Project

Citywide, NYC's tree inventory includes over 590,000 publicly managed street trees, which are distributed amongst the five boroughs – Brooklyn, 24 percent, Bronx, 10 percent, Manhattan, 8 percent, Queens, 41 percent, and Staten Island, 17 percent –. But this is not enough; there is a requirement to increase tree planting to maintain the flow of benefits provided by the urban forest currently, as explained clearly in the NYC Municipal Forest Resource Analysis 2007 report. NYC's street trees intercept 1432 gallons of stormwater annually, and are valued at \$61 per tree. Rainfall interception by trees as mini-reservoirs, controlling runoff at the source, reduces the magnitude of floods during large storms. (Peper *et al.*, 2007) Also, these trees affect air quality, are temperature reduction and other microclimatic effects; removal of air pollutants; emission of volatile organic compounds and tree maintenance emissions; and energy conservation in buildings and consequent power plant emissions (Nowak *et al.*, 2007: 13). Therefore, under the PlaNYC 2030, MillionTreesNYC is implemented since 2007.

MillionTreesNYC is a public – private initiative to plant one million trees by 2017, legislation requiring the city to formulate a plan to reduce sewage overflow, and an \$80 million commitment to energy efficiency programs for city government. According to this, NYC will plant 70 percent of the trees in parks and other public spaces, while the other 30 percent will come from private organizations, homeowners, and community organizations. (MillionTreesNYC, <http://www.milliontreesnyc.org>, last visited: 07.15.2013) Founded in 1995, New York Restoration Project (NYRP) which is a non-profit organization dedicated to transforming open space in underserved communities to create a greener, more sustainable NYC, is leading this initiative in partnership with the Bloomberg administration. Also the NYC Department of Parks & Recreation (Parks), which is responsible for greening and maintaining the city's open spaces, is another partner of this project, along with the Home Depot Foundation as a financial supporter. NYC has planted more than 750,000 trees (MillionTreesNYC, <http://www.milliontreesnyc.org>, last visited: 07.15.2013) across the five boroughs so far.

Citi Bike initiative

Citi Bike is a privately owned, for-profit public bicycle sharing system which serves NYC's residents and also, the biggest system in the nation. Initially, this system was selected in September 2011 to develop and operate the system using Bixi Technology which is a public bicycle sharing system launched in May 2009 in the city of Montreal, and was comprised of 10,000 bikes and 600 portable, solar-powered docking stations (Matthews, <http://www.greenconduct.com>, last visited: 07.17.2013). But the implementation of this system did not start in July 2012 planned, and was delayed because of first software glitches (Lyon, <http://www.gothamgazette.com>, last visited: 07.17.2013; Fleischfresser, <http://www.smartplanet.com>, last visited: 07.17.2013) in contractor Alta's operating system and later Hurricane Sandy, which damaged bicycles in storage at Brooklyn Navy Yard (Davies, <http://www.businessinsider.com>, last visited 07.17.2013; Lyon, <http://www.gothamgazette.com>, last visited: 07.17.2013).

Citi Bike is a part of a \$41 million sponsorship deal with Citigroup Inc. for five-years (Fried and Kazis, <http://www.streetsblog.org>, last visited: 07.17.2013). It finally began operations in May 2013, with 330 docking stations in Manhattan south of 59th Street (Clark, <http://www.ny1.com>, last visited: 07.17.2013) and in Brooklyn north of Atlantic Avenue and west of Nostrand Avenue (Miller, <http://www.streetsblog.org>, last visited 07.17.2013). The system has started with 6,000 bikes at these stations, but its goal is to expand the city's network of bike lanes to 10,000 bikes and 600 stations (Meggison, <http://gas2.org>, last visited: 07.17.2013), and to the Bronx, Queens and other parts of the City. Today it has more than 113,000 subscriptions, and it is growing. The system helps reduce injuries by upwards of 40 percent for everyone including pedestrians and motorists and nearly 75 percent in risk, according to Sadik-Khan, Commissioner of NYC Department of Transportation. (City & State, 2013: 30, 32) As a means of urban transportation, Citi Bike is important because of its contribution to NYC's sustainability, with regard to reducing carbon emissions of NYC in particular, despite delays and problems with its implementation. Also the pros and cons of Citi Bike will occur over time.

3. REGULATORY BACKGROUND

PlaNYC has the binding commitments to provide the sustainability programs of NYC. As a part of these commitments to reduce the effects of changing climate, the some of PlaNYC's initiatives, as mentioned above, converted into legally binding requirements in city laws and regulations. (Bratspies, 2013: 20) The administration aims to ensure local climate change initiatives by building codes, standards and regulations, even if the other

administrations, who have a political vision that does not adopt the idea of same adaptation and mitigation, come to power. This will surely not be enough; however this strategy at the local level needs to be transferred to the national level. There has been above-party political interest, and also this reflects as the success of administration. In this section, we address only many relevant legal regulations, standards, and policies to promote adaptation to climate change under the PlaNYC, although there are thousands of them. For example, the NYC has only implemented more than 25 construction safety laws which have been passed since 2008, affecting construction sites citywide. (NYC Buildings, <http://www.nyc.gov>, last visited: 11.16.2015).

The New York City Climate Protection Act

Enacted as Local Law 22 of 2008, the New York City Climate Protection Act (the “Act”) establishes the NYC’s Climate Action Plan. The Act is a local law to amend the administrative code of the City about reducing GHG emissions and repeal of the Local Law 55 for the year 2007. Under the Act, NYC commits to a 30 percent of the municipal GHG emissions reductions below 2005 by 2030, and a 30 percent in City government emissions below fiscal year 2006 levels by 2017, as well as a requirement that the City produces an annual assessment and analysis of citywide GHG emissions. The Act explains also these reductions would be achieved through the policies, programs, and actions of the PlaNYC 2030. (The New York City Council, <http://legistar.council.nyc.gov>, last visited: 07.29.2013)

Department of Environmental Protection Rules Regarding the Use of #4 and #6 Fuel Oil in Heat and Hot Water Boilers & Burners

NYC uses 1 billion gallons of heating oil annually, more than any other city of the U.S., accounting for nearly 14 percent of the City’s total PM2.5 emissions of the citywide average. The City’s air quality, thus, threatens public health, contributing to approximately 6% of annual deaths; particularly among vulnerable populations such as children. (NYC.gov, <http://nytelecom.vo.llnwd.net>, last visited 08.01.2013) For this, in January 2011, the NYC Department of Environmental Protection promulgated the Fuel Oil Rules; the amendments to Chapter 2 of Title 15 of the Rules of the City of New York regarding emissions from the use of grade numbers 4 and 6 fuel oil in heat and hot water boilers and burners (NYC.gov, <http://www.nyc.gov>, last visited: 07.30.2013). The Rules which set the standards for all existing and new boilers in NYC, aim to phase out highly polluting heating oils in favor of less polluting alternatives (Bratspies, 2013: 20) by 2030.

One of the proposed requirements of the Rules that the boilers must use either #2 or #4 fuel oil or natural gas in order to receive a Certificate of Operation for owners with an existing Work Permit. Boilers using #6 fuel oil will not receive a renewed Certificate of Operation, unless emissions are less than #4 fuel oil on an annual basis. Thus, #6 fuel oil can no longer be used. Also, for new installations, applications for a Work Permit must specify that the equipment will use either fuel oil #2 and/or natural gas, unless emissions are less than fuel oil #2 on an annual basis. For example, #4 fuel oil can no longer be used. Finally, as of January 1, 2030 boilers are required to use either #2 fuel oil or natural gas in order to receive a new or renewed Certificate of Operation, unless emissions are less than #2 fuel oil on an annual basis. This schedule will provide owners with time to convert to #2 fuel oil, or its equivalent, or natural gas, while ensuring more rapid transition from the most polluting fuel oil. (AKRF Leaders in Environmental, Planning & Engineering Consulting, <http://www.akrf.com>, last visited 07.30.2013) All these reductions are crucial to protect the health of New Yorkers in particular; a report issued by the New York City Department of Health and Mental Hygiene in 2011 projected that even a reduction of 10 percent could prevent more than 80 premature deaths, 180 hospital admissions and 950 emergency department visits (New York City Department of Health and Mental Hygiene, <http://www.nyc.gov>, last visited 07.10.2013). The NYC Bar Committee on Environmental Law recommends also that the NYC administration work together the related groups including the Rent Stabilization Association, the coop groups, and the New York Oil Heating Association, to create incentives to shift to cleaner fuels and to upgrade boilers for cleaner and more efficient burning (Robb and Skroback, 2011: 16-17; New York City Bar, <http://www.nycbar.org>, last visited: 08.06.2015).

New York City's local energy performance laws

As noted previously, the NYC administration signed four local laws as a part of the City's Greener, Greater Buildings Plan which is the most comprehensive program in the country to reduce GHG emissions from existing and new buildings, in December 2009. Enacted to improve the energy efficiency of existing buildings, these laws apply to all NYC properties 50,000 gross square feet or larger in size, and thus, are expected to reduce GHG emissions citywide by nearly 5 percent, result in a net savings of \$7 billion, and create almost 17,800 construction-related jobs by 2030. (Urban Green, <http://www.urbangreencouncil.org>, last visited: 11.16.2015; NYC.gov, <http://www.nyc.gov>, (last visited: 08.01.2013) Briefly, these address a different side of improving energy efficiency in the NYC's buildings, as shown in Table 1 below, and aim at promoting energy conservation in NYC.

<i>Law</i>	<i>Jurisdiction</i>	<i>Requirements</i>	<i>Benefits</i>	<i>Timeline</i>
Energy & Water Benchmarking: Local Law 84 of 2009	All buildings in the New York City	Closure of the 50percent loophole. Renovations of less than half the gross square footage of a structure must comply with energy code.	New lighting, HVAC, and building operations technologies can develop much faster, and renovated buildings will see significant energy savings.	July 1, 2010
New York City Energy Conservation Code: Local Law 85 of 2009	All buildings in the New York City over 50,000 square feet	Requires annual tracking of water and energy use through the U.S. EPA's Energy Star Portfolio Manager.	An energy star rating allows building managers to compare their energy efficiency to similar buildings.	Reporting required in May 2011 (May 2010 for city buildings); collection of 2010 water and energy data required.
Audits & Retro-commissioning: Local Law 87 of 2009	All buildings in the New York City over 50,000 square feet	Energy Audit (meeting standards of ASHRAE Level II) and retro-commissioning required. Identify capital projects with "reasonable" pay back periods. Implementation is not required.	Quantifying the payback period for energy efficiency improvements justifies retrofitting projects to management teams. Projects are eligible for points towards their LEED certification.	Energy efficiency reports are due between 2013 and 2020 in accordance with the building's tax block number.
Lighting Upgrades & Sub-metering: Local Law 88 of 2009	All buildings in the New York City over 50,000 square feet	1. Major tenants with over 10,000 square feet must be sub-metered for electricity.	Sub-metering allows tenants to track their individual electricity consumption.	Sub-metering must be implemented by January 1, 2025.
		2. All non-compliant lighting systems must be upgraded to meet the New York City Energy Conservation Code.	Lighting accounts for 18% of energy use in buildings. Reducing the lighting load is an inexpensive and easy way to see immediate reductions in electricity costs and carbon emissions.	All lighting systems are required to meet section 805 of the New York City Energy Conservation Code by January 1, 2025.

Source: (Bonded Building & Engineering, <http://www.bondedbuilding.com>, last visited: 08.03.2013)

One of these laws, Local Law 84 of 2009 (Benchmarking Energy & Water Usage), requires that buildings submit an annual analysis of their energy usage using an online benchmarking tool (known as the “Portfolio Manager”) created by the U.S. Environmental Protection Agency. This benchmarking system enables the NYC’ building owners to better understand their performance. (RAND, <http://randpc.com>, last visited 08.01.2013) Accordingly, by starting

May 1, 2011, they are required to submit their usage for the electricity, gas, fuel oil or steam, and water utilities for the previous calendar year to the U.S. Department of Finance, or if not, these owners will be fined \$500 per quarter, up to \$2,000 per year. Subsequent reports are due each year on May 1st. (NYC Benchmark, <http://www.nycbenchmark.com>, last visited 08.01.2013)

In August 2012, the New York City Local Law 84 Benchmarking Report was released as the first analysis of NYC benchmarking data collected pursuant to Local Law 84. This report provides the current state of energy consumption and performance in large buildings citywide. NYC's 2,065 buildings, constituting 2.6 billion square feet in size, accordingly, benchmarked their energy for 2011, an approximately 75 percent compliance rate. One of the key findings of the report is that on average, NYC's buildings have a median Energy Star score of 64 (out of 100), which is in line with other buildings in the Northeast but better than the national average for buildings of 59. Newer office buildings tend to use more energy per square foot than older ones, which seems surprising at first blush. However, older buildings tend to have less extensive ventilation systems, better thermal envelopes, and less dense or energy intensive tenant occupations. Also larger office buildings tend to be more energy intensive than smaller ones, but smaller multifamily buildings tend to be more energy intensive than larger ones. In addition to, bringing large buildings up to the median EUI in their building type category could reduce total NYC building energy consumption by roughly 18 percent and GHG emissions by 20 percent. (NYC.gov, <http://www.nyc.gov>, last visited 08.01.2013)

New York City's energy code, or NYC Energy Conservation Code (known as "Local Law 85"), is the second law in the Greener, Greater Buildings legislation. Setting standards for the energy performance of buildings citywide (NYC.gov, <http://www.nyc.gov>, last visited 08.02.2013), the Code is based largely upon the 2010 Energy Conservation Construction Code of New York State (ECCCNYS), Local Law 48 of 2010 and Local Law 1 of 2011. (NYC.gov, <http://www.nyc.gov>, last visited: 08.02.2013) The Code requires that renovations of existing buildings meet at least energy conservation standards applied to all new construction projects that submit construction approval documents to the U.S. Department of Buildings on or after July 1, 2010, and building alterations resulting in the replacement of minimum 50 percent or more of buildings systems (DSIRE, <http://www.dsireusa.org>, last visited 08.01.2013).

Local Law 87 of the NYC's Greener, Greater Buildings Plan requires energy audits and retro-commissioning of base building systems of certain buildings and retro-fitting of certain all city-owned buildings over 50,000 square feet in size, as listed by the Department of Finance, once every ten years, beginning in 2013. Also, this law requires an American Society of Heating,

Refrigeration and Air-Conditioning Engineers Inc. level II Energy Audit and a retro-commissioning study of base building systems in order to increase the energy efficiency of the largest NYC buildings. Accordingly, the energy audits must encompass all base building systems, defined to include the building envelope, HVAC systems, conveying systems, domestic hot water systems, and electrical and lighting systems that will save energy, but also must identify all reasonable measures and capital improvements that would result in energy use or cost reductions, the associated savings, cost of implementation, and simple payback period. Building owners, afterwards, must ensure that retro-commissioning is completed by a retro-commissioning agent for the required base systems, which must comprise an analysis of operating protocols, calibration and sequencing, cleaning and repairs, and training and documentation. Building owners also are required to submit energy efficiency reports to the Department of Buildings that include both an energy audit report and a retro-commissioning report. But Leadership in Energy and Environmental Design (“LEED”)-certified Existing Buildings already as being highly energy efficient are exempt from the requirements under certain circumstances. (NYC.gov, <http://www.nyc.gov>, last visited 08.03.2013; New York County NYCLA Lawyers’ Association, <http://www.nycla.org>, last visited 08.01.2013).

In NYC non-residential lighting accounts for almost 18 percent of the energy use in its buildings and roughly 18% of carbon emissions from its buildings. Rapid improvements in lighting technology over past two decades have made it feasible to notably reduce energy consumption by installing more efficient lighting systems, and any investments made to install such systems will typically be paid for through operational savings. Also, many buildings depend on a single meter to monitor electricity consumption. Individual tenants would likely reduce their energy consumption if energy use information were made available to them regularly. Local Law 88 of 2009, another component of the Greener, Greater Buildings Plan developed by the PlaNYC, requires upgrading of lighting systems and the installation of sub-meters providing to achieve significantly energy savings in larger buildings to comply with the NYC Energy Conservation Code standards, which include lighting controls (interior lighting controls, light reduction controls and automatic lighting shutoff), tandem wiring, exit signs, interior lighting power requirements and exterior lighting. By January 1st, 2025 with the NYC Department of Buildings, reports documenting the lighting upgrades, installation and use of electrical sub-meters must be completed. (NYC.gov, <http://www.nyc.gov>, last visited: 08.05.2013).

Building energy efficiency legislation

The NYC Council enacted four law to increase the City’s energy efficiency as part of the PlaNYC. Passed on October 6, 2010, these local laws intend to

take away inefficient construction code requirements and support the use of new environmentally-friendly technologies (Fernandes et al., <http://www.clm.com>, last visited: 08.12.2013) which aim to improve lighting system energy efficiency. Local Law 47 of 2010 which took effect January 1, 2010, alters building code requirements for egress lights in lobbies and hallways (NYC.gov, <http://www.nyc.gov>, last visited: 08.12.2013). To address energy efficiency in commercial buildings, Local Law 48 of 2010 requires the use of vacancy sensors. This local law allows the city to amend the Energy Code to reduce energy consumption beyond the state code, in relation to establishing reporting requirements for the department of citywide administrative services on the status of city-owned real property. Effective as of December 28, 2010, this local law also adds a requirement that sensors and controls (including occupant sensors) in classrooms, conference rooms, employee lunch and break rooms and offices smaller than 200 square feet; only enable lights to be turned on manually, automatically shut lights off within 30 minutes of all occupants leaving the space, and enable lights to be turned off manually. (NYC.gov, <http://www.nyc.gov>, last visited: 08.12.2013); Fernandes et al., <http://www.clm.com>, last visited: 08.12.2013) Another is Local Law 51 of 2010 took effect July 1, 2011, which improved the efficiency of high lighting at temporary walkways, foot bridges and sidewalk sheds at construction sites. This local law also allows the use of photo sensors to control this lighting. (NYC.gov, <http://www.nyc.gov>, last visited: 08.12.2013) Finally, effective as of January 1, 2011, Local Law 52 of 2010 amends housing maintenance code provisions related to lighting in corridors. Also this law allows the use of photo sensors to control this lighting. (NYC.gov, <http://www.nyc.gov>, last visited: 08.12.2013).

4. CONCLUSION

The catastrophic effects of global warming can be seen in NYC today. As of now, the NYC as a coastal city has faced different climate risks such as heat waves and storm surges, which affect everyday life citywide, and, if current trends continue, they will become more frequent and severe. Hurricane Sandy which has devastated the East Coast is just the latest example.

Being aware of these consequences, the NYC administration has taken measures both to resolve the crisis arising climate change – environmental, social and technological –, to turn to opportunities since 2002. Under PlaNYC, which could be called “ambitious”, the Administration has carried out successfully initiatives such as the Greener, Greater Buildings Plan to tackle climate change through reducing GHG emissions, with mostly 30 percent below current levels by 2030. These initiatives, which providing the examples of best practices at the local level, help to create a more resilient the NYC, with a long-term focus on preparing for the impacts of climate change. However the weakest side of these,

maybe, is that the NYC has limited financial resources. This can turn a disadvantage because of other pressing needs and tight budgets.

Additionally, this strategy of the NYC administration at the local level should be transferred to the national level, and also adopted as above-party political interest, as mentioned frequently in our study. Achieving this challenge will require integration with the national preparedness system across adaptation and mitigation. In June 2013, the U.S. Government released a rebuilding strategy to strengthen all communities in the U.S. at risk from extreme weather and promised to help local governments strengthen their infrastructure (Executive Office of the President). Thereby, this is important in terms of additional support and guidance from the federal government. Moreover, the most recent local government elections in NYC have taken place on November 5, 2013; it is very important whether or not the next mayor has same policies. In addition, the NYC may need many more strategies in adapting citywide to a changing climate, as well as current politics. To ensure that the NYC is resilient to existing and future climate risks, the next mayor must take further action. Because NYC' next mayor will have inevitably to address and tackle the complex and crucial problems and its impacts facing the city post-Sandy, and other climate change threats in the future. Aggressive administrative efforts have achieved great success.

The NYC administration is a good municipal example for the cities in Turkey, especially for its coastal cities such as Istanbul and Izmir that are vulnerable to climate change effects. This is worth considering not only in terms of best practices, but also an evidence of fulfillment the administrative success in a short period of time, the last 12 years. In fact, NYC is late relatively to address climate change, when compared to other cities such as Los Angeles, Seattle and Denver in the nation. For example, as one of the C40 cities, Istanbul, located in northwestern Turkey, is in a similar situation now, and needs to a comprehensive program which are preparing risk assessments, setting GHG emission reduction targets and pledging to act, just as the PlaNYC. The effort of NYC's administration may be able to provide lessons to our cities as they plan adaptation strategies.

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