

# **From Green to Resiliency: A Review of Evolution, Experiences and Implementations of American Climate Change Action Plan**

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## **1 Introduction**

Among the inducements to global climate change, cities with its artificial environment play the most important roles. On the other hand, cities suffer a lot from threatens of global warming, followed sea level rise, and shortage of energy sources. Consequently, urban areas are pivotal to global adaption and mitigation efforts. In the past decades, there has been a lot of countries throughout the world signing agreements as well as launching climate change actions plans. But how do cities actually perform in terms of climate change response? What are the plan visions, how to implement, through what approaches and strategies? This research sheds light on city-level climate action plans in the United States. Since 2000s, there have been over 170 local authorities and municipalities participating into CCP movement (Cities for Climate Protection). Almost all cities in America enacted related climate action plans at least five years ago, and have released a series of reviews and reports in following years. While the review and investigation of plans is beneficial for cities in other countries that are willing to make efforts as response to climate change, there is a lack in current relative literatures that focus on systematically reviewing the planning implementation as well as the policy-making process.

Through reviewing hundreds of climate action plans, this research aims to answer the following questions: (1) how have the values and targets of climate action plan evolved during the past couple of years? (2) which authorities take charge of making the plans, and (3) how to guarantee the implementation and how do plans perform? This paper makes a comprehensive analysis of the plans quantitatively and qualitatively in terms of policy-making stakeholders, planning targets, constitutions, implementation mechanism, and socio-economic guarantee. It then makes a deep review on a series of sustainable plans of New York City from 2007 to 2016.

## **2 Climate Action Plans in American Cities**

### *2.1 Development of Cities Climate Protection Program*

At the federal level, the U.S. has been a slow starter on climate change policy but has shown progress during the Obama administration, with the Clean Power Plan, investments in renewable energy, fuel efficiency standards for cars and the recent refusal of the Keystone XL pipeline. Yet, despite a politically gridlocked congress, 74 percent of Americans favor federal regulation on greenhouse gas emissions, according to a 2015 poll. This reality makes city action all the more important as local governments are able to push for the climate action that Americans are hoping for.

With cities responsible for more than 70 percent of global greenhouse gas emissions, there is an acute need to capitalize on local solutions to climate change, particularly in the lead up to the COP21 climate conference in Paris. American cities are positioning themselves as the true leaders when it comes to tackling climate change, making it clear that action is wanted, needed and possible. Within recent years, U.S. cities have started reducing their greenhouse

gas emissions, as their citizens are feeling the impacts of climate change, such as floods, storms and droughts. Local leaders are well-poised to address these problems with adaptation and mitigation measures due to the fact that city governments are smaller and more agile in their decision-making and more directly accountable to their constituents than their national counterparts, making them more able and willing to act. Action at local levels also has the benefit of yielding near-immediate results, while nationwide changes can take a number of years—and political terms—to materialize.

The Cities for Climate Protection program (CCP) is one of three major global transnational municipal networks aimed at reducing urban greenhouse gas emissions. Established in 1990 by the International Union of Local Authorities and the United Nations Environment Program, one of the largest global transnational networks, the International Council for Local Environment Initiatives (ICLEI), presented a framework to represent local government environmental concerns internationally. The ICLEI strives to ‘establish an active and committed municipal membership... that promotes environmental and sustainable development initiatives within...[a] framework of decentralized cooperation’. In 1993, subsequent to an ICLEI successful pilot scheme, the Urban CO<sub>2</sub> Reduction Project, the CCP program was established during the post-Rio Earth Summit era. The CCP program illustrates itself within local climate policy, as a transnational governance network. So far, ICLEI USA has worked in hundreds of cities and towns around the country, in red states and blue states, in communities wealthy and underserved. At the local level nearly everywhere is inspiring in its connectivity, tolerance, and dedication to keep and maintain relationships.

100 Resilient Cities (100RC) is an innovative global network pioneered by the Rockefeller Foundation to help cities around the world become more resilient to the physical, social, and economic challenges that are a growing part of the 21st century. New York City was in the first wave to join the network in 2013, and through its participation, demonstrates leadership in resiliency and takes advantage of the resources and opportunities it presents.

## 2.2 Exemplars

Together with Los Angeles, Chicago, and New York City, the three largest American cities now boast the “80 by 50” target. This signifies the fact that in the U.S., cities are taking lead on developing and implementing the solutions needed to take action on climate change.



Figure 1. Some large cities in the US taking climate action plans

Washington, DC has entered into a 20-year power purchase agreement (PPA) that greens the district’s electricity supply while saving taxpayer money. Under the PPA, the nation’s

capital does not pay for the wind farm itself, but rather, agrees to purchase wind electricity every year at a fixed rate 30 percent lower than fossil fuel power. Wind power procured under the PPA will supply roughly one-third of the District government's electricity from a 46 megawatt wind farm.

Portland, Oregon has been an American leader on climate change for many years and its 2015 Climate Action Program takes an innovative step further by analyzing how Portland residents' and businesses' purchasing habits influence greenhouse gas emissions elsewhere in the world. This consumption-based emissions inventory methodology enables the city to track the emissions it is responsible for regardless of where those emissions took place, and to better comprehend exactly how the city contributes to climate change in order to develop additional mitigation opportunities.

According to a recent study, New Orleans, Louisiana is the most at risk of all American cities from rising sea levels, since, by the most conservative estimates, more than 98 percent of its population will live below sea level in the future. Facing complex climate change-related challenges—including diminished protective wetlands, intense storm threats, land subsidence and regular flooding—the City of New Orleans has improved collaboration between agencies to close gaps in services, which has led to a reduction of 135,000 tons of CO<sub>2</sub> in municipal energy use related to water management and reconstruction the city's streets, drainage and sewer systems.

In a hallmark challenge to make Philadelphia “The Greenest City in America,” Mayor Michael Nutter has committed to reducing the City's exposure to rising energy prices, to limiting the City's environmental footprint, and repositioning the workforce and economic development strategies to leverage an enormous competitive advantage in the emerging green economy. He created the new cabinet-level Office of Sustainability and a Sustainability Advisory Board representing public, private, and nonprofit interests from across the metropolitan area. In April 2009, the City launched “Greenworks,” an innovative action plan focusing on Energy, Environment, Equity, and Economy. PWD's Green City, Clean Waters plan integrates management of Philadelphia's watersheds into this larger context. It is designed to provide many benefits beyond the reduction of combined sewer overflows, so that every dollar spent provides a maximum return in benefits to the public and the environment. Philadelphia's Green City, Clean Waters plan is a unique and fresh approach that supports numerous EPA initiatives at a time when our nation's cities need 21st Century solutions to aging infrastructure problems.

### **3 Evolution of Green Plans in New York City**

#### *3.1 PlaNYC 2007-2013*

A growing population, aging infrastructure, a changing climate, and an evolving economy posed challenges to the city's success and quality of life. New York City Municipality recognized that they will determine the city's own future by how the citizens as well as local authorities respond to and shape these changes with their own actions.

In 2007, Mayor Michael R. Bloomberg released the first PlaNYC, which focused on responsibly meeting the city's growing population and infrastructure needs. It is a bold agenda to meet these challenges and build a greener, greater New York. Titled ‘A Greener, Greater New York’, it included the City's initial sustainability strategy, and became the model for other large global cities. PlaNYC outlined measures to address the city's aging infrastructure, support parks, improve the quality of life and health for New Yorkers, and for the first time ever, commit to a goal for reducing greenhouse gas emissions. PlaNYC 2011 expanded on these initiatives by strengthening the City's commitment to environmental stability and livable neighborhoods, launching brownfield cleanups, and improving the quality of our air and water.

Since the first PlaNYC in 2007, the City has made considerable progress on reaching its goals. The city has reduced greenhouse gas emissions 19 percent since 2005, invested billions of dollars to protect our water supply, planted nearly a million trees, installed 300 miles of bike lanes, and passed regulations and developed programs to phase out polluting heating oils. The City also strengthened coastal defenses, fortified crucial infrastructure such as wastewater treatment facilities, and worked to make buildings and neighborhoods more resilient. In just four years the city has added more than 200 acres of parkland while improving existing parks. More than 64,000 units of affordable housing were created or preserved. The government has provided New Yorkers with more transportation choices, and has enacted ambitious laws to make existing buildings more energy-efficient.

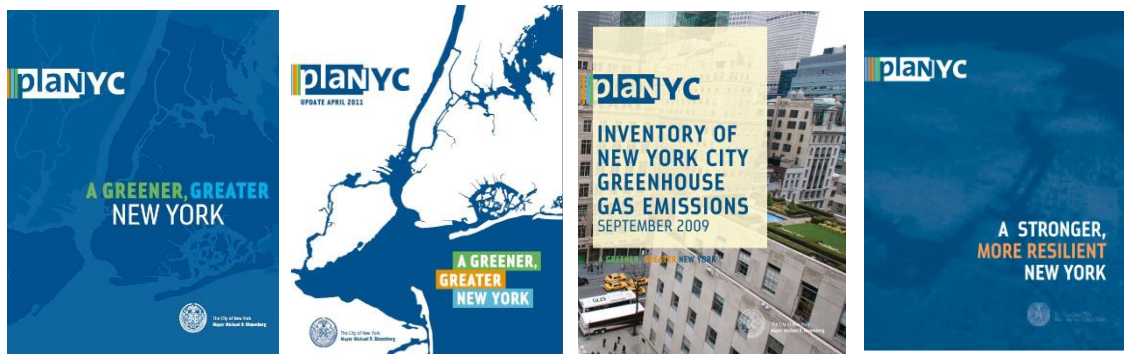


Figure 2. Plans about PlaNYC

In 2013, after Hurricane Sandy, the City released PlaNYC: A Stronger, More Resilient New York, which documented the lessons learned from Sandy, developed a strategy for the city to build back, and developed recommendations to adapt the city to the projected impacts of climate change, including rising sea levels and extreme weather events.

### 3.2 GIs in New York City

City climate action plans are steering cities in their implementation of policies and actions providing both tangible local benefits and contributing to global impact. Case in New York City shows that cities can leverage the benefits of green infrastructure in their climate action planning.

New York City's efforts to improve water quality are a critical part of PlaNYC, Mayor Bloomberg's blueprint for a greener, greater city. Already the Harbor is cleaner than it has been in over 100 years, and millions of people enjoy the City's waterfront and waterways every year, thanks in part to the New York City Department of Environmental Protection's (DEP's) investment of billions of dollars in sewer and wastewater treatment plant upgrades. But in those waterbodies that do not yet meet water quality standards for pathogens, the biggest remaining challenge is to further reduce combined sewer overflows (CSOs) that discharge a mixture of untreated sewage and stormwater runoff when it rains. Traditional approaches to reduce CSOs further would include the construction of additional, large infrastructure, but the remaining opportunities for such construction are very expensive, and do not provide the sustainability benefits that New Yorkers rightly expect from multi-billion dollar investments of public funds.

The Green Infrastructure Plan presents an alternative approach to improving water quality that integrates "green infrastructure," such as swales and green roofs, with investments to optimize the existing system and to build targeted, smaller-scale "grey" or traditional infrastructure. This is a multi-pronged, modular, and adaptive approach to a complicated problem that will provide widespread, immediate benefits at a lower cost. The green infrastructure component of this strategy builds upon and reinforces the strong public and government support that will be necessary to make additional water quality investments. A critical goal of the green infrastructure component is to manage runoff from 10% of the impervious surfaces in combined sewer watersheds through detention and infiltration source controls.

This Green Infrastructure Plan builds upon and extends the commitments made in PlaNYC and the Sustainable Stormwater Management Plan. This plan provides a detailed framework and implementation plan to meet the twin goals of better water quality in New York Harbor and a livable and sustainable New York City. The analysis in this Green Infrastructure Plan is based upon the predicted impacts of the strategy on CSO volumes in individual watersheds and upon the City's estimates of capital and operating costs. Further analysis, which is substantially under way, will refine the modeling and projections in this report by using more updated geospatial impervious data, incorporating detention technologies, and assessing the impact of CSO reductions on water quality. It will also present data about the operating costs, maintenance, and performance of the green infrastructure projects currently underway. This Green Infrastructure Plan forms a framework for CSO reduction strategies and investments over the next 20 years and will lead to both clean waterways and a greener, more sustainable city.

### *3.3 Evolution of a Solid Foundation*

New Yorkers have a long and proud tradition of confronting tough issues head on, with determination and heart, and having the skills to get the job done. Through it all, the city has remained tolerance and diversity, one that has drawn people from around the world since the origins as a Dutch settlement. The government has a noble history of innovating urban policies that have been adopted across the country and around the world. The city created the first fire districts and a Board of Health committed to eradicating cholera and other epidemics, a system of reservoirs to bring water to the city and engaged creative designers to build great public parks, a citywide zoning ordinance that became a worldwide model. The government pioneered school meals programs, settlement houses for a booming immigrant population, and social programs that became a template for the New Deal and the Great Society. Today, it is leading the way in curbing greenhouse gas emissions and preparing for climate change.

From 2012 to 2014, the de Blasio administration of New York City presented a series of long-term goals and strategies, and launched comprehensive initiatives across City agencies. For instance, Pre-K to all is a plan to create a truly universal pre-kindergarten system, with a seat in a high-quality pre-kindergarten class for all four-year-olds in need of such services. Vision Zero commits the City to using every tool at its disposal to improve the safety of our streets and to reduce traffic fatalities to zero. One City: Built to Last commitment to cut its greenhouse gas emissions 80 percent by 2050 focusing on reductions in buildings, which are responsible for nearly three quarters of the city's contribution to climate change. Housing New York is an ambitious ten-year plan that addresses New York's housing crisis by building our next generation of affordable housing and supporting the quality of life in our neighborhoods. Career Pathways is a plan to create a more comprehensive, integrated workforce development system and policy framework focused on skills building and job quality. One City, Rebuilding Together aims to overhaul the Build It Back program to accelerate the Sandy recovery process for homeowners and establish targets for reimbursements and construction starts. It also established a first-ever Mayor's Office of Recovery and Resiliency to lead the City's climate adaptation and resiliency program.

The city released a series of plans in 2015. IDNYC provides a free identification card to every city resident, including the most vulnerable populations who may have difficulty obtaining other government-issued ID, and provides access to services and programs offered by the City and other businesses. New York City Community Schools Strategic Plan provides key system-building efforts that will be implemented over the next three years to achieve and surpass the City's initial goal of establishing 100 fully developed Community Schools to improve student achievement through strong partnerships among principals, parents, teachers and Community Based Organizations. The CEO Poverty Measure Report is an annual report by the Center for Economic Opportunity in the Office of the Mayor that measures poverty in New York City and is aligned with OneNYC's focus on anti-poverty goals. The CEO measure improves on the official methodology by considering the cost of

living in New York City and the resources available to households after tax and social policy is taken into account. Ten-Year Capital Strategy provides a blueprint for capital spending over the next decade. OneNYC and the Ten-Year Capital Strategy are aligned to ensure funding for OneNYC goals.

These initiatives have already begun to show results, which become a solid foundation for city mission transforming from single green toward resilient development.



Figure 3. Evolution of several long term goals and strategies after PlaNYCs

#### 4 From Green to Resiliency: One New York

As a pacesetter in sustainable American city development, New York City faces more opportunities and choices for urban development. It cannot fully predict its vulnerability because of the difficulty in foreseeing urban disasters, risk degree, and potential losses. Coupled with its high susceptibility and low adaptability, any serious disaster may be disastrous. Consequently, it is significantly important to ensure the safety of New York City. Resilient city aims to make citizens and property perform better than those relatively lack of flexibility and adaptability under extreme pressure while subjected to major disaster attacks (Bolin and Stanford, 1998).

From the perspective of etymology, the word of "resilience" first came from the Latin word "resilio," with the meaning of "returning to the original state" (Alexander, 2013). After going through the three stages of engineering resilience, ecological resilience, and evolution resilience, it has been formally applied to urban studies. At present, evolution resilience is more academically accepted. Shao Yewen et al. (2015) argue that resilient city emphasizes the continuous adaptation, learning ability, and innovation, and has the attribute of dynamic systems closely related to continuous adjustment. Xu Jiang et al. (2015) proposes the issue that resilient city has to solve is adaptability when social ecosystem faces "uncertain disturbances," laying more emphases on the systematic and long-term city security and showing more respects for the evolution law of urban systems. Jha et al. (2013) argue that

resilient city should have four characteristics involving infrastructure resilience, institutional resilience, economic resilience, and social resilience, so as to mitigate urban crisis in a number of aspects. Although domestic and foreign scholars differ in their interpretations on resilient city, there is a general consensus on the idea that resilient city should have dynamic learning ability, multi-dimensional dispersion of external disturbance, and the ability to mobilize social forces (Davoudi, Shaw, and Haider, 2012; Allan and Bryant, 2011; Jabareen, 2013; Campanella, 2008; Ahern, 2011; Zheng, 2013).

With 45 percent of residents at or near the poverty line, New York City recently launched OneNYC—a comprehensive plan to for sustainable development in the Big Apple with a special focus on socioeconomic equity that aims to lift 800,000 New Yorkers out of poverty by 2025 as well as reducing CO2 emissions by 80 percent by 2050. The plan: One New York: The Plan for a Strong and Just City builds upon these initiatives as a launching point for the ambitious goals set forth in this plan. With the launch of OneNYC, the municipality builds on New York City’s global leadership when it comes to growth, sustainability, and resiliency—and embrace equity as central to that work. The plan includes adaptation measures to protect vulnerable, low-income communities from flooding and long term displacement after shock events, like Superstorm Sandy. OneNYC will also ensure that, by 2040, 90 percent of New Yorkers can reach at least 200,000 jobs by transit within 45 minutes by 2040.



Figure 4. Cover of OneNYC

#### 4.1 Concepts and Focuses

OneNYC is a citywide effort. Nearly all City agencies came together in cross-cutting working groups that examined underlying trends and data in order to develop new initiatives. The working groups were tasked with envisioning how the physical city should be shaped to address a range of social, economic, and environmental challenges on the municipal and regional scale.

Extensive pre-launch discussions with New Yorkers directly shaped the goals and initiatives detailed in this plan. When nearly 3,500 people submitted comments to the online survey about housing and affordability, the research group affirmed the affordable housing commitments in Housing New York, the City’s ten-year housing plan. That plan lays out strategies to create and preserve 200,000 affordable housing units over the next ten years. OneNYC now sets a goal of creating 240,000 new housing units—both market rate and





## 4.2 Visions and Strategies

New York City's success has brought many benefits, but the city also faces significant challenges. Thus it is time to build on the strengths and address these challenges and opportunities. The city is at risk when so many New Yorkers struggle to find living-wage jobs, good schools for their children, affordable housing, and neighborhoods and communities they can proudly call their home for years to come. OneNYC builds upon the four core challenges addressed in past PlaNYC reports, and now includes growing inequality, the importance of the region, and New York City voices.

The plan runs the risk of becoming two New Yorks: one for the affluent and one for those who are left out of the city's success and lack access to good schools or good wages for hard work. Now the plan chooses to confront these challenges will define the future of New York City and what kind of city left to our children.

OneNYC conducts four principles which informed the plan's goals and initiatives: growth, equity, sustainability, and resiliency. "Growth" refers to population growth, real estate development, job creation, and the strength of industry sectors. "Equity" is about fairness and equal access to assets, services, resources, and opportunities so that all New Yorkers can reach their full potential. "Sustainability" contains strategies improving the lives of our residents and future generations by cutting greenhouse gas emissions, reducing waste, protecting air and water quality and conditions, cleaning brownfields, and enhancing public open spaces. Finally, "resiliency" is related to the capacity of the city to withstand disruptive events, whether physical, economic, or social.



Figure7. Four Pillars of OneNYC

In each vision, the OneNYC sets up a series of goals, followed by deep description on each goal. The descriptions includes indicators, target, and figure for most recent year in each goal. Furthermore, there are about 3-5 initiatives in each goal, accompanying with the departments and authorities which enact the initiatives as well as sources of budget. The table below shows the funding status and funding source for each OneNYC initiative and supporting initiative. Specific funding details for newly funded initiatives are available in a separate table featured in the FY'16 Message of the Mayor, and are marked with an asterisk.



Figure 8. Vision, goals and initiatives



Figure 9. Initiatives, Implementation Authorities, and Budget

### 4.3 Progressive Evaluation

OneNYC emphasizes the initiatives and milestones for the pillar of “resiliency”. At the end of this plan, it reported the progressive outcomes of each initiatives in the aspects of resiliency, following with description of initiative status, 2014 milestones, and status of milestones. It is

worthy to mention that the plan divided each initiative into detailed approaches and strategies. For instance, in the initiative of “strengthen the quality of available climate analysis”, there are six steps, such as “Work with FEMA to improve the flood-mapping process” (in progress), “Call on the State and Federal governments to coordinate with the City on local climate change projections” (completed), and so on.

Chapter	Initiative No.	Initiative	Initiative Status	Initiative Status Description	2014 Milestone	Milestone Status
CLIMATE ANALYSIS	<b>STRENGTHEN THE QUALITY OF AVAILABLE CLIMATE ANALYSIS</b>					
	1	Work with FEMA to improve the flood-mapping process	In Progress	The City continues to work with FEMA to improve the flood mapping process and provided expert analysis in FEMA's most recent release of Preliminary FIRMs. The first Technical Mapping Advisory Council meeting, on which the City sits, was held in September 2014. The next one will be held in May 2015.	Implement technical and process improvements	Completed
	2	Work with FEMA to improve the communication of current flood risks	In Progress	The City has partnered with the Center For New York City Neighborhoods (CNYCN) on its interactive webtool (floodhelpny.org), which was launched in September 2014. Additionally, the City is conducting a consumer education campaign and developing tools for explaining flood risk and the changes that are coming to the maps and insurance programs. Finally, the City continues to advise FEMA on its local flood risk messaging and online tools.	Launch a new interactive tool	Completed
	3	Call on the State and Federal governments to coordinate with the City on local climate change projections	Completed	NOAA and the USACE have agreed to incorporate the most recent NPCC projections into their climate models.	Obtain Federal agreement to rely on NPCC	Completed
	4	Continue to refine local climate change projections to inform decision-making	Completed	The City released expanded NPCC projections to include humidity and new projections through 2100. NPCC3 will focus on the following: enhancing coordination across the entire New York metropolitan region, looking at a neighborhood scale, and studying the interactions of mitigation, adaptation, and equity.	Issue expanded NPCC projections; release evaluation metric for climate change	Completed
	5	Explore improved approaches for mapping future flood risks, incorporating sea level rise	In Progress	The City, with Stevens Institute of Technology, has completed its study of Sea Level Rise mapping, which was incorporated into the NPCC's most recent report. NPCC has also developed future flood maps to show the projected floodplains.	Develop revised future flood maps	Completed
6	Launch a pilot program to identify and test strategies for protecting vulnerable neighborhoods from extreme heat health impacts	In Progress	The City, in partnership with the Nature Conservancy, has launched a new urban heat island working group to develop new monitoring methods and tools for mitigating heat risk.	Launch pilot program	Partially Completed	

Figure 10. Detailed analysis of resiliency development

## 5 Conclusion

One trend we’ve identified is that American cities are positioning themselves as the true U.S. leaders in combating climate change, making it clear that action is wanted, needed and possible. American cities are positioning themselves as the true U.S. leaders in combating climate change, making it clear that action is wanted, needed and possible.

Based on a series of green plans, the climate action plans have moved their targets from simply reducing GHG toward creating a resilient city that not only mitigating hazards to environment but also improving social performance. The stakeholders involved in the plan vary a lot, depending on different local circumstance. But there is an increasing number of cities calling for collaboration among market, government and public citizens. With regard to the content of climate action plans, strategies have evolved from simply reducing energy consumption and gas relief toward multiple approaches in addressing social and economic vulnerability involving neighborhood, building, urban infrastructure, and specific geographic issues. The efforts for sustainable development require a transformation of policy from green development toward improvement on resiliency. Thus, further changes to planning implementation in terms of financial support, public participation, and post-evaluation mechanism will be still needed.

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