

1.5°C

**ALIGNING NEW YORK CITY
WITH THE
PARIS CLIMATE AGREEMENT**



The City of New York
Mayor Bill de Blasio

Anthony Shorris
First Deputy Mayor

#ONENYC

1.5°C

ALIGNING NEW YORK CITY WITH THE PARIS CLIMATE AGREEMENT

MESSAGE FROM THE MAYOR



Friends,

In New York City, we have known for some time that we have to address the existential crisis of climate change. Superstorm Sandy showed us the terrible cost of our warming planet. We had hoped we could depend on the federal government for leadership. Now we know we cannot. President Trump's decision to pull the United States out of the Paris Climate Agreement has set us on a dangerous path of denial.

The City of New York was already taking action to reduce emissions 80 percent by 2050. Now, we have to take matters into our own hands and go further. That is why on June 2, 2017, I signed Executive Order 26 committing New York City to the principles of the Paris Agreement, which seeks to limit global temperature rise to 1.5 degrees Celsius.

I have directed all agencies of City government to develop their own plans to accelerate our 80 x 50 efforts and bring us in line with the Paris Agreement. This plan is the first of its kind and lays out the pace, scale, and impact of the work we must do by 2020 to achieve this goal. It also commits us to work with other cities to develop a protocol to reduce our carbon footprint to zero.

When our national government falls down, local governments have to step up. I am proud that New York City will play its part and that we are joining in common cause with hundreds of local governments around this nation and the world. Together, we will show that the people will solve this problem at the grassroots.

Mayor Bill de Blasio

September 2017

MESSAGE FROM C40 CITIES EXECUTIVE DIRECTOR

In December 2016, C40 and Arup published *Deadline 2020: How Cities Will Get the Job Done*, which quantified the contribution that mayors can make to deliver the goals of the Paris Climate Agreement. Our conclusion was that it is still possible to prevent runaway climate change — limiting temperature rise to no more than 1.5 degrees Celsius above the pre-industrial average — but to do so global city emissions have to peak by 2020, then decline to an average of three metric tons CO₂e per capita by 2030, and hit zero by 2050.

Achieving those targets is now C40's number one goal, not least because we also calculated that if every city with a population over 100,000 followed the 91 C40 cities' example, it would deliver 40 percent of the emissions reductions needed to achieve the global Paris Agreement goal. C40's mayoral Steering Committee subsequently agreed that to remain a C40 member, each city must have published a plan and deliver against those *Deadline 2020* targets by the end of 2020 —turning the aspirations of the Paris Agreement into urban action.

I congratulate Mayor de Blasio and his team on reaching that goal. *1.5°C: Aligning New York City with the Paris Climate Agreement* is a world-leading example of evidence-based, integrated and ambitious climate action planning and has been reviewed as compatible with C40's emerging Deadline 2020 Climate Action Planning Framework.

Cities all around the world will be inspired by New York City's example and C40 looks forward to encouraging them to learn from it, as well as to share back with New York great ideas from other cities that are every day being shared and copied within our network.

Mark Watts

September 2017

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1.5°C: Aligning New York City with the Paris Climate Agreement is published pursuant to Executive Order 26 of 2017. This document was produced by the New York City Mayor's Office of Sustainability.

ONE NYC PRINCIPLES THAT INFORM GOALS AND INITIATIVES

Growth

Equity

Sustainability

Resiliency

Why 1.5°?

The Paris Climate Agreement (Paris Agreement), signed by nearly every country, commits signatories to limit global temperature rise to well below 2 degrees Celsius (3.6°F) and to aspire to limit global temperature rise to 1.5 degrees Celsius (2.7°F). New York City's Executive Order 26, signed by Mayor de Blasio on June 2, 2017, commits the City to develop a pathway to achieve the greenhouse gas (GHG) emissions reductions necessary to align with the principles of the Paris Agreement and a 1.5 degree Celsius outcome.

The difference between current global warming trends and a 1.5 degree Celsius outcome may seem inconsequential, but the difference in impacts would be dramatic. If the world collectively limits warming to 1.5 degrees, we will see reduced impacts from climate change relative to the risks we face in a warmer world.

For example, current climate projections from the NYC Panel on Climate Change show that:

- NYC faces increased sea level rise, flooding, precipitation, and a greater frequency of more intense storms from climate change. This will result in heightened risks for residents, buildings, and public infrastructure. By the 2050s, high-end projections show sea levels may rise by up to 30 inches, and average annual precipitation may increase as much as 13 percent.
- If climate change goes unabated, NYC can expect increased average temperatures and frequency of heat-waves that would change the livability of the city and put vulnerable populations further at risk. On the high-end for the 2050s, average temperatures are projected to rise by up to 6.6°F (3.7°C) in the NYC metropolitan region, and the area could see as many as seven heat waves per year.

Aligning with a 1.5 degree Celsius outcome is about preventing the worst projected climate impacts, both locally and globally. The actions necessary to ensure a 1.5 degree Celsius outcome will mean a future where New Yorkers can breathe cleaner air, live in more comfortable homes, enjoy access to safe and diverse modes of sustainable transportation, and reside in a city resilient to severe weather effects. This is the NYC we are building today.

Introduction

On June 1, 2017, President Trump announced his intention to withdraw the United States from the Paris Climate Agreement (Paris Agreement), abdicating American leadership on climate change, one of the most significant challenges facing humanity. The next day, Mayor de Blasio signed Executive Order 26, committing the most populous city in the United States to the principles of the Paris Agreement and to developing a pathway to advance the Paris Agreement goal of limiting global temperature rise to 1.5 degrees Celsius. Hundreds of other U.S. cities and institutions followed suit by reiterating their commitment to reduce greenhouse gas (GHG) emissions — sending a profound signal to the world that the majority of Americans will not retreat from this existential fight.

The success of the Paris Agreement hinges — now more than ever — on the involvement of cities like New York to put their resources, innovation, and leadership into play. To prevent the worst impacts of climate change, cities across the planet must dramatically reduce their GHG emissions to limit the increase in the global average temperature to well below 2 degrees Celsius above pre-industrial levels, and reach even further to support the collective effort to limit temperature rise to less than 1.5 degrees Celsius.

In 2014, the City of New York (the City) committed to reducing its GHG emissions 80 percent by 2050, compared to 2005 levels (80 x 50). The City's 2016 report, *New York City's Roadmap to 80 x 50*, used the best available science and state-of-the-art analysis to identify strategies in the buildings, energy, waste, and transportation sectors that would achieve 80 x 50 based on current technology.

NYC's progress toward 80 x 50 continues: our air is cleaner, our energy is greener, and we are sending less waste to landfills. Meeting the global carbon budget to keep global temperature rise to 1.5 degrees Celsius requires that the City implement a priority subset of its 80 x 50 strategies by 2020 in order to accelerate GHG reductions. This plan clearly lays out the pace, scale, and impact of

actions across the built environment that are necessary to bring NYC's actions in line with the Paris Agreement's 1.5 degree Celsius outcome — and commits the City to lead in the development of a global protocol for carbon neutrality.

Equity and climate change are inexorably linked. While climate change affects everyone, its impacts are not equally shared. Simply put, the poorest and most vulnerable are the hardest hit. Therefore, the work to reduce GHG emissions must address economic and social inequities. This plan assesses near-term actions for their impacts and benefits, such as improved local air quality, preservation of housing affordability, and increased access to transportation and resources. The City will continue to incorporate equity in its climate policies and programs to achieve more environmentally and economically just outcomes for all New Yorkers.

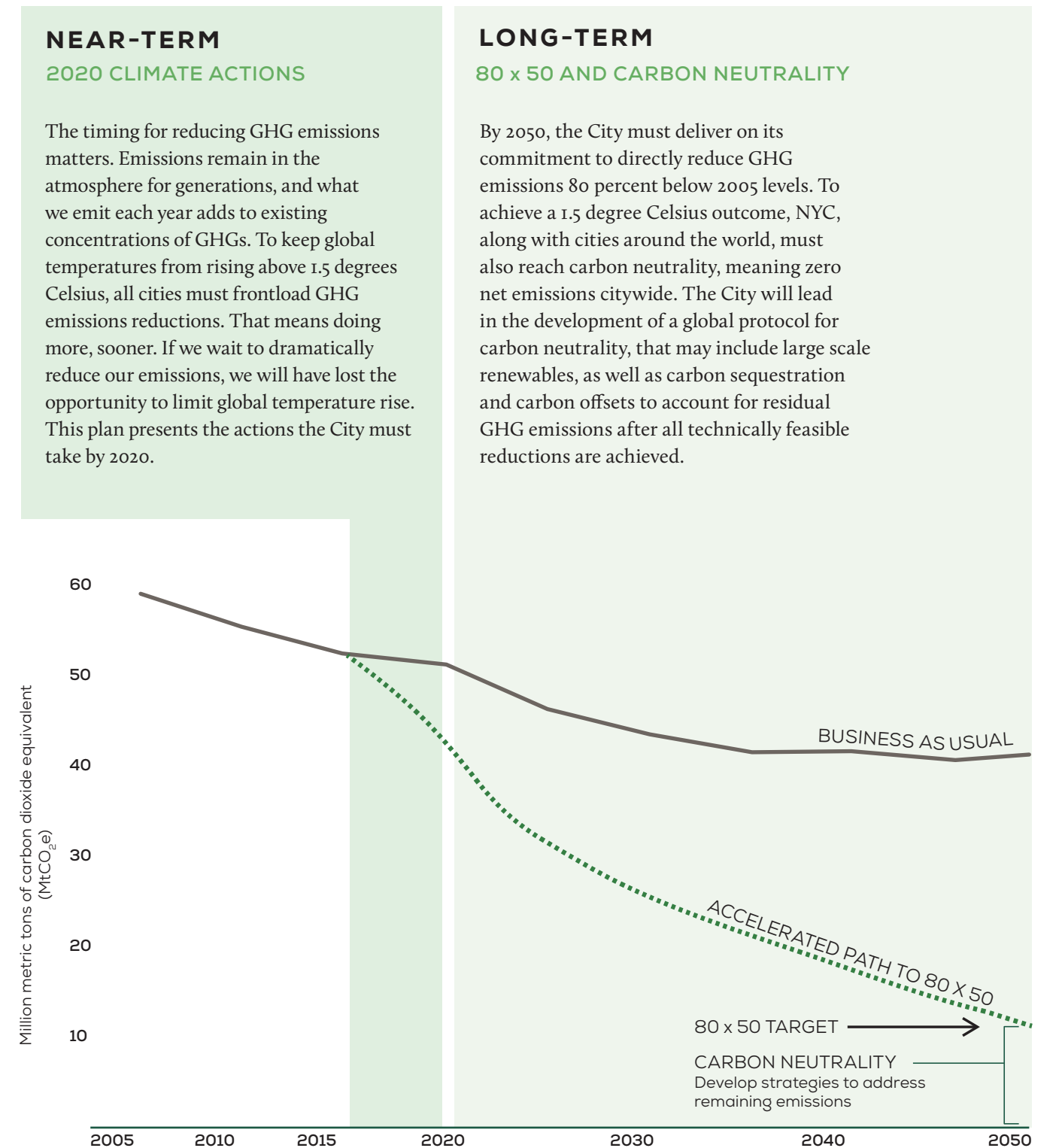
Achieving the City's climate objectives is no easy task and will require active participation by New Yorkers to transform the buildings we live in, the places we work, the ways we travel, and the goods we consume. The City must prioritize resources, policies, and programs that facilitate this transition.

NYC and the world, must recognize the urgency of this challenge and take bold action to protect the human rights imperatives of the Paris Agreement. This is the only way forward.

1.5°: Global Goal, Local Action

2014	NYC COMMITS TO 80 x 50	The mayor commits NYC to achieve 80 percent GHG emissions reductions by 2050 (80 x 50), a target informed by the United Nations Framework Convention on Climate Change. Local Law 66 of 2014 codifies the commitment.
2015	NYC RELEASES ONE NEW YORK: THE PLAN FOR A STRONG AND JUST CITY (ONENYC)	OneNYC establishes the plan for a strong and just NYC and establishes visions that inform all City goals and initiatives: growth, equity, sustainability, and resiliency.
2016	NYC RELEASES NEW YORK CITY'S ROADMAP TO 80 X 50	The <i>Roadmap to 80 x 50</i> draws on best-in-class analysis and extensive stakeholder engagement to understand how to achieve 80 x 50 across NYC's buildings, energy supply, transportation, and waste sectors with existing technology.
	GLOBAL PARIS CLIMATE AGREEMENT ENTERS INTO FORCE	The Paris Agreement marks an historic occasion in which 196 countries' agreed to work together to hold the increase in global average temperature to well below 2 degrees Celsius (3.6°F) above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees Celsius (2.7°F).
2017	NYC COMMITS TO THE PRINCIPLES OF THE PARIS CLIMATE AGREEMENT	Executive Order 26 commits NYC to the principles of the Paris Agreement, including climate actions that are consistent with or greater than 80 x 50, and to align with the Paris Agreement goal of limiting global temperature increase to 1.5 degrees Celsius.
	NYC RELEASES 1.5°C: ALIGNING NEW YORK CITY WITH THE PARIS CLIMATE AGREEMENT	This plan assesses the pace and timing with which NYC must reduce GHG emissions and draws on previous analysis to identify actions the City must take by 2020 in order to align the City's 80 x 50 strategies with the Paris Agreement and a 1.5 degree Celsius outcome. NYC is the first city to release a 1.5 degree Celsius, Paris Agreement-compatible climate action plan.

How NYC Will Help Achieve a 1.5° World





NYC's 2020 Climate Actions

1.5°C: Aligning New York City with the Paris Climate Agreement commits the City to specific actions that accelerate near-term GHG reductions and enable deeper reductions over the next 30 years. This plan is not a menu from which we can pick and choose; the City must implement each action by 2020 and continue to take bold action thereafter to ensure that we meet our climate goals.



Actions are organized using the same sectors identified in the *Roadmap to 80 x 50* — buildings, energy, transportation, and waste — and by their ability to enable reduced and efficient consumption, the transition to clean energy, and climate change leadership.



The following section highlights key actions alongside a dashboard that presents all of the City's near-term commitments to accelerate GHG reductions by 2020. The dashboard includes a description of each action, the City agency that will lead its implementation, the projected GHG emissions reductions, the necessary associated investments, and an assessment of the benefits that extend beyond GHG reductions. These benefits are rooted in *OneNYC's* goals for building an equitable, sustainable, and resilient city to address issues of income inequality, housing affordability, access to public transit, aging infrastructure, and other major urban challenges.

KEY FINDINGS

TOTAL GHG REDUCTION POTENTIAL OF ALL MEASURABLE 2020 CLIMATE ACTIONS: 10 MILLION METRIC TONS OF CARBON DIOXIDE EQUIVALENT (CO₂e) BY 2030

BY 2030, ACTIONS FROM THE BUILDINGS SECTOR WILL REMOVE APPROXIMATELY 500,000 POUNDS OF FINE PARTICULATE MATTER (PM_{2.5}) EMISSIONS EVERY YEAR, IMPROVING AIR QUALITY AND AVOIDING 40 PREMATURE DEATHS AND 100 EMERGENCY ROOM AND HOSPITAL VISITS ANNUALLY

NEAR-TERM ACTIONS WILL RESULT IN DRAMATIC BENEFITS INCLUDING ECONOMIC INNOVATION, HEALTH AND WELLBEING, AFFORDABILITY, AND QUALITY JOBS FOR NEW YORKERS

Key Actions to Reduce Consumption and Increase Efficiency

New York City must limit energy demand in buildings and vehicles to reduce emissions and make a renewables-based grid more affordable and attainable. Limiting waste will further reduce emissions.

BUILDING ENERGY PERFORMANCE MANDATES

Major GHG Reduction Potential

In NYC, fossil fuels burned in buildings for heat and hot water are the biggest source of GHG emissions, accounting for 39 percent of the citywide total. The burning of these fuels also contributes to air pollution that causes asthma, bronchitis, and premature death, particularly among children and seniors. Reducing on-site fossil fuel use and requiring today's worst performing buildings to operate efficiently is a prerequisite to achieving the City's climate goals.

The City will pursue legislation to require that all large buildings limit fossil fuel use below intensity targets by 2030 and 2035. This is the single largest action the City will implement to reduce GHG emissions and will affect over half the built floor area in NYC. This action will also require setting energy intensity requirements that take into consideration impacts on utilities, specific tenant uses, and economic activity.

Benefits include avoiding 40 premature deaths and 100 emergency room visits annually through air quality improvements and creating 17,000 construction-related jobs by 2030.

DEEP ENERGY RETROFITS IN CITY-OWNED BUILDINGS

Moderate GHG Reduction Potential

City operations account for 5 percent of citywide GHG emissions. In 2015, the City committed \$2.7 billion to retrofit City-owned buildings. The City must accelerate the pace of deep energy retrofits throughout its portfolio to achieve citywide climate goals and lead by example.

This year, the City will launch a new program to prioritize buildings across agencies in which to implement a range of energy conservation measures at scale. The City will also commit agencies to achieve an additional 20 percent energy reduction across their portfolios by 2025.

Benefits include reducing operating expenses for the City, improving air quality and health, and demonstrating leadership to influence market transformation.

ADVANCED BUILDING CODES

 Major GHG Reduction Potential

New buildings have a critical role to play in reducing GHG emissions. New and substantially renovated buildings that require low levels of energy will prevent future GHG emissions, reduce the need for energy efficiency retrofits, and provide ancillary benefits that increase market transformation for retrofits in existing buildings.

The City will work with the New York City Council to adopt “stretch” versions of the energy code in 2019 and 2022 which could realize a 20 percent and 40 percent energy intensity reduction, respectively, over current construction standards for new and substantially renovated buildings. Beginning in 2025, all large new buildings would be required to build to very-low energy design targets. Energy design targets for new construction provide basic metrics of efficiency that a building must meet and do not prescribe methods, giving developers flexibility to reach targets. This approach can achieve significantly greater energy reductions than incremental energy code updates to specific measures.

Benefits include bolstering long-term affordability of new buildings through reduced operating costs, further developing the workforce to provide energy efficiency retrofits in existing buildings, and creating healthier indoor and outdoor spaces.

PROPERTY ASSESSED CLEAN ENERGY FINANCING (PACE)

 Enabling, Accelerating, or Multiplying GHG Reduction Effect

Clean energy and energy efficiency building upgrades require upfront capital to unlock energy savings and reduce GHG emissions. Traditional financing terms often do not match the longer payback period of clean energy or energy efficiency upgrades, which prevent owners from pursuing projects that could result in long-lasting operational savings. PACE is a financing mechanism that treats clean energy and energy efficiency upgrades as a public benefit — like a new sewer, water line, or road — and allows upgrades to be financed through property bills with no money down. PACE has been used to finance projects with higher upfront costs and longer payback periods by underwriting to energy savings.

The City will launch a Commercial Property Assessed Clean Energy (C-PACE) program to finance clean energy and energy efficiency upgrades at more favorable terms. Paired with a building energy performance mandate, a PACE program in NYC has the potential to finance \$100 million annually in energy efficiency and clean energy projects.

Benefits include providing an affordable pathway for building owners to implement deep energy reductions and deploy clean energy technologies.

NYC BUILDING PROGRAMS

 Major GHG Reduction Potential

The City is committed to helping building decision-makers pursue energy efficiency and clean energy projects. The NYC Retrofit Accelerator and Community Retrofit NYC programs currently assist decision-makers of over 4,000 buildings in identifying energy and water saving retrofit opportunities and connecting to financial and technical resources. The NYC Carbon Challenge voluntary leadership program is working with more than 100 companies and organizations that have committed to 30, 40, or 50 percent reductions in GHG emissions.

The City will work to expand these and launch a new program to support the real estate industry to implement low energy design for new construction and substantial renovations. The City will release a free planning tool for high performance energy retrofit strategies for existing large buildings to achieve deep energy reductions.

Benefits include lowering building energy costs for owners and residents, improving housing quality for tenants, improving skills of the workforce, and improving air quality for all New Yorkers.

SUSTAINABLE TRANSPORTATION

 Major GHG Reduction Potential

Roughly 90 percent of NYC’s current transportation GHG emissions come from private vehicle travel. To reduce this source of emissions, the City has committed to an 80 percent sustainable mode share by 2050, meaning four out of every five trips a New Yorker takes will be by foot, bicycle, or public transit.

The City will support improvements to the subway and bus systems, create new miles of protected bike lanes, and expand bike share to double the number of active cyclists by 2020. The City will further work to limit both personal and commercial vehicle miles traveled by supporting shared mobility options, expanding smart parking policy that prioritizes access to curb space, and exploring options for low emission zones that limit access in the city for the worst polluting vehicles.

Benefits include improving air quality and health, increasing access to sustainable, efficient, and active forms of transportation, reducing commute times, and creating safer streets for pedestrians and bicyclists.

ORGANICS SEPARATION

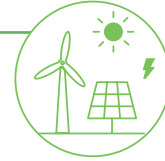
 Major GHG Reduction Potential

When New Yorkers’ waste goes to landfills, it decomposes and sends methane, carbon dioxide, and toxins into the atmosphere. Diverting organic waste from landfills reduces GHG emissions.

The City will implement citywide organic waste collection. This includes expanding the curbside organic waste collection program, increasing the number of drop off sites, helping to expand community composting sites, working with landlords to enable all residents to separate their food waste, and expanding the number of businesses required to separate organics.

Benefits include improving the health and wellbeing of New Yorkers by reducing the number of rats and vermin with hard-sided, latched bins for storing organics.

Key Actions to Transition to Clean Energy



New York City must transition away from using fossil fuels and toward renewable energy. This will not only require action by City government, but also action by residents, businesses, and the State and federal entities that regulate the electric system.

⚡ 100% RENEWABLE ELECTRICITY FOR CITY OPERATIONS

Major GHG Reduction Potential

City operations are responsible for 8 percent of NYC's total GHG emissions from electricity use. To encourage the transition to a renewables-based electric supply, the City must lead by example by greening its operations.

The City is committed to powering its operations with 100 percent renewable electricity as soon as sufficient supply can be brought online. The City will also explore the feasibility of mechanisms that pool purchasing power of residents and businesses to procure additional low-cost renewable energy.

Benefits include catalyzing local renewable energy markets, improving health outcomes by reducing the use of fossil fuel-based in-city generators, strengthening the resiliency of the electricity supply, and expanding access to clean renewable power.

⚡ RENEWABLES-BASED ELECTRIC SUPPLY

Enabling, Accelerating, or Multiplying GHG Reduction Effect

Currently, New York State's transmission system does not enable renewable energy produced in northern and western portions of the state to flow into NYC. To reduce reliance on old, inefficient fossil fuel-based in-city generators, and to benefit from a more renewables-based grid, the City will need a coordinated expansion of transmission capacity statewide.

As New York State ramps up to its target of 50 percent renewable energy under the Clean Energy Standard's 50 x 30 renewable energy target, the City will work toward integrating renewable energy into NYC's energy supply, continue to advocate for new transmission to bring upstate renewable power into the city, and continue to work with utilities to encourage technologies that create a more flexible, distributed grid in order to increase the share of renewable energy in NYC. The City will also work to increase energy storage, laying the groundwork for a more flexible grid that can adapt to a greater reliance on intermittent renewable energy.

Benefits include supporting economic and technological innovation, improving air quality and health from reduced fossil fuel-based energy, and fortifying system resiliency.



ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

Major GHG Reduction Potential

In April 2017, Mayor de Blasio announced a target for 20 percent of all motor vehicle sales for use in NYC to be plug-ins by 2025. Electric vehicles (EVs) represent less than one percent of all NYC vehicle registrations today, largely owing to a lack of charging opportunities. New Yorkers will need to rely on public-access, centralized, and high-speed charging locations to support the dramatic transition to EVs that is necessary to reduce transportation GHG emissions.

The City will accelerate the shift to EVs by investing a minimum of \$10 million toward the installation of 50 fast charging hubs across all five boroughs by 2020 with at least one in each borough by 2018, exploring the role of electric car share, and procuring zero- and low-emission freight vehicles.

Benefits include improving access to clean transportation options and reducing noise and air pollution from fossil fuel-based vehicles. EVs can also enhance utilization of electricity assets and keep utility costs manageable over time through off-peak charging.



Key Actions to Provide Climate Change Leadership



New York City must leverage its influence throughout the five boroughs and beyond its borders. This demonstration of leadership will advance climate action on the global stage, and engage New Yorkers in local actions.

CARBON AND OTHER EXTERNALITIES ACCOUNTING



A carbon price captures the external costs of GHG emissions by placing a price on the emission of a ton of CO₂e into the atmosphere. The City will continue to integrate the social cost of carbon to determine cost-effectiveness of energy investments. Accounting for environmental externalities to the city strengthens the business case for aggressively reducing GHG emissions and will support the acceleration of GHG reductions.

The City will actively participate in the New York Independent System Operator's (NYISO) exploration of carbon pricing in the wholesale energy market and continue to advocate for aggressive federal regulation of GHG emissions. The City will also continue to advocate for New York State's efforts to develop a comprehensive valuation of distributed energy resources to monetize external benefits from clean distributed energy deployment. These external benefits include avoided GHG emissions and local air pollutants, enhanced resiliency, and clean energy investments in environmental justice communities. The City will also advocate that State and federal decision-making incorporates impacts to local air pollution, resiliency, and other aspects of a sustainable future.

Benefits include transforming markets across buildings, energy, and transportation sectors, and improving air quality and health by reducing fossil fuel combustion.

GLOBAL CITIES PROTOCOL FOR CARBON NEUTRALITY



By 2050, all cities must achieve carbon neutrality, or net zero emissions, to avoid the worst impacts of climate change and to achieve a 1.5 degree Celcius outcome.

The City will develop a global carbon neutrality protocol for cities in partnership with C40 and other leading cities. This protocol will create a shared definition of carbon neutrality, define the role of carbon sequestration and carbon offsets, and provide guidance on a path to carbon neutrality. This global protocol will enable the City to develop future strategies to achieve carbon neutrality.

Benefits include increasing the likelihood of realizing a safe, healthy, sustainable future through appropriate strategies that encourage others to act.

ENHANCED CLIMATE COMMUNICATIONS



76 percent of New Yorkers are concerned about environmental issues but do not always know what they can do to help address climate change. All New Yorkers must take actions to achieve the City's ambitious, but necessary climate goals. The City will engage New Yorkers in this fight, educating citizens on choices and steps they can take to reduce their GHG footprint, and sending important market signals to industries and businesses to prioritize low carbon products and goods. New Yorkers are leaders and together can achieve great things. Communication is a tool to further unlock the potential of New Yorkers and to accelerate progress toward a better and climate-ready NYC.

The City will develop a climate communication campaign to raise awareness about the City's current strategies and programs, engage New Yorkers on solutions, and advocate for important policies and issues.

Benefits include accelerating GHG emissions reductions and catalyzing industries through market signals, and encouraging residents to demand climate-smart homes, energy, goods, and services.



2020 Climate Actions

LEGEND

SECTOR

- All Sectors
- Buildings
- Energy
- Transportation
- Waste

GHG REDUCTION

- Major Reduction Potential Greater than 400,000 tCO₂e by 2030
- Moderate Reduction Potential Up to 400,000 tCO₂e by 2030
- Enabling, Accelerating, or Multiplying Effect

INVESTMENT

- > \$1 billion opportunity through 2030
- \$100 million - \$1 billion opportunity through 2030
- \$10 - \$100 million opportunity through 2030
- \$0 - \$10 million opportunity through 2030

Lead City Agency names listed in full on page 62

ONE NYC VISION

- Growth
- Equity
- Sustainability
- Resiliency

BENEFIT POTENTIAL

- Major Potential Benefit
- Moderate Potential Benefit
- Some Potential Benefit

	ACTION	LEAD	GHG REDUCTIONS	CITY INVESTMENT	NON-CITY INVESTMENT
REDUCED AND MORE EFFICIENT CONSUMPTION	Implement long-term energy intensity requirements in existing buildings	MOS	Major Reduction Potential	> \$1 billion opportunity through 2030	> \$1 billion opportunity through 2030
	Accelerate deep energy retrofits to achieve a 20% deeper reduction in energy consumption in City-owned buildings by 2025	DCAS	Moderate Reduction Potential	\$100 million - \$1 billion opportunity through 2030	\$10 million - \$100 million opportunity through 2030
	Continue progress toward New York City Housing Authority's (NYCHA) climate commitments, including 20% reduction of energy use per square foot by 2025, installing 25 Megawatts (MW) of solar capacity by 2026, and 30% reduction of GHG emissions by 2027	NYCHA	Moderate Reduction Potential	\$10 million - \$100 million opportunity through 2030	\$10 million - \$100 million opportunity through 2030
	Advocate for more stringent efficiency standards for appliances and vehicles at the regional and national levels	MOS	Enabling, Accelerating, or Multiplying Effect	\$0 - \$10 million opportunity through 2030	not assessed
	Advocate for incentives to support deep energy retrofits focusing on preserving affordability	MOS	Enabling, Accelerating, or Multiplying Effect	\$0 - \$10 million opportunity through 2030	not assessed
	Implement advanced energy codes for new buildings in 2019, and achieve very low energy design targets in all new buildings and major renovations in subsequent code cycles	MOS & DOB	Major Reduction Potential	\$0 - \$10 million opportunity through 2030	> \$1 billion opportunity through 2030

GROWTH EQUITY SUSTAINABILITY RESILIENCY

	QUALITY JOBS	ECONOMY AND INNOVATION	WORKFORCE DEVELOPMENT	LONG-TERM COST SAVINGS	HEALTH AND WELLBEING	SAFETY	AFFORDABILITY	ACCESS	COMMUNITY	LEAD BY EXAMPLE	RESILIENCY	RELIABILITY	NATURAL CAPITAL
Implement long-term energy intensity requirements in existing buildings	Major	Major	Moderate	Major	Major	Some	Major	Major	Major	Major	Major	Major	Major
Accelerate deep energy retrofits to achieve a 20% deeper reduction in energy consumption in City-owned buildings by 2025	Moderate	Moderate	Major	Major	Major	Some	Major	Major	Major	Major	Major	Major	Major
Continue progress toward New York City Housing Authority's (NYCHA) climate commitments, including 20% reduction of energy use per square foot by 2025, installing 25 Megawatts (MW) of solar capacity by 2026, and 30% reduction of GHG emissions by 2027	Moderate	Moderate	Major	Major	Major	Some	Major	Major	Major	Major	Major	Major	Major
Advocate for more stringent efficiency standards for appliances and vehicles at the regional and national levels	Some	Major	Some	Moderate	Major	Some	Major	Major	Major	Major	Major	Major	Major
Advocate for incentives to support deep energy retrofits focusing on preserving affordability	Moderate	Moderate	Some	Moderate	Major	Some	Major	Major	Major	Major	Major	Major	Major
Implement advanced energy codes for new buildings in 2019, and achieve very low energy design targets in all new buildings and major renovations in subsequent code cycles	Major	Major	Moderate	Major	Major	Some	Major	Major	Major	Major	Major	Major	Major

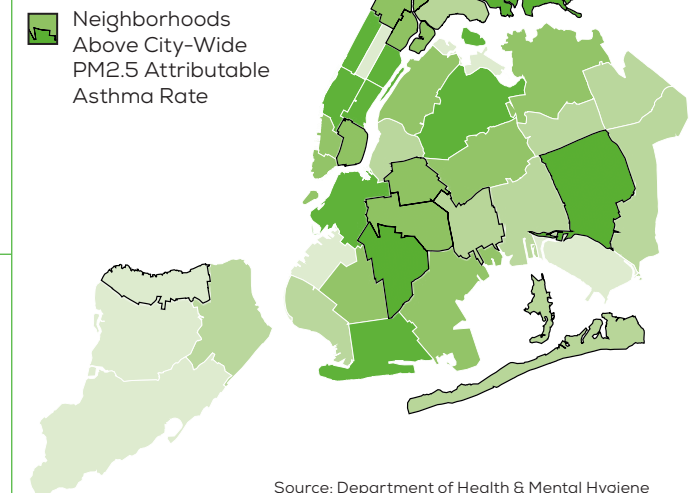
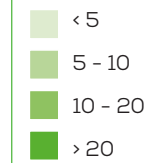
SPOTLIGHT: QUALITY JOBS

Potential to create 17,000 new construction-related jobs through 2030

SPOTLIGHT: HEALTH, WELLBEING, AND EQUITY

IMPROVING AIR QUALITY BY REDUCING FOSSIL FUEL USE









DECREASE IN PM2.5 EMISSIONS (TONS/YEAR)























































Source: Department of Health & Mental Hygiene

The proposed building energy performance mandate would have a significant impact on improving air quality in some of the most air-pollution-burdened neighborhoods in the city, specifically reducing fine particulate matter (PM2.5) which is known to contribute to asthma and other serious illnesses. By 2050, assuming energy performance mandates are fully implemented across large buildings, 100 premature deaths would be avoided each year.

REDUCED AND MORE EFFICIENT CONSUMPTION

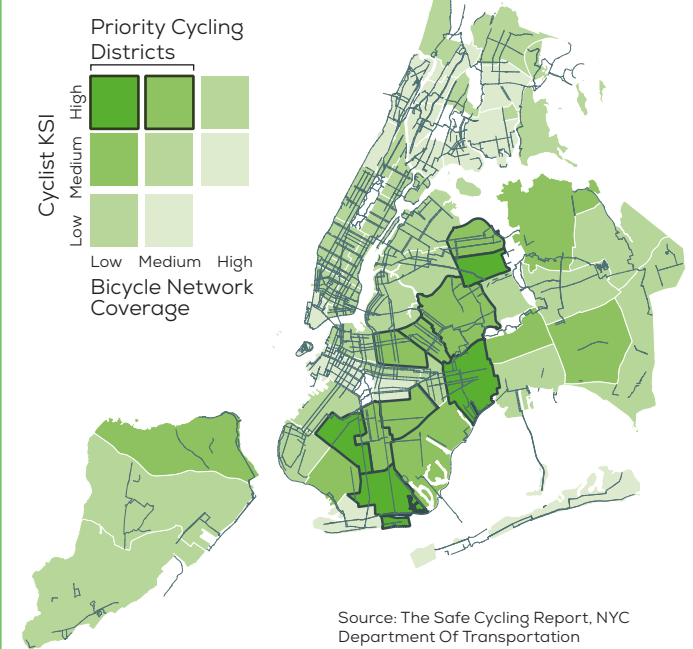
ACTION	LEAD	GHG REDUCTIONS	CITY INVESTMENT	NON-CITY INVESTMENT
 Provide energy use information to more building owners, managers, staff, tenants, and residents, including by requiring energy disclosure at point of sale and energy grades for large buildings	MOS		(\$)\$	(\$)
 Help a broad range of building decision-makers implement energy efficiency and clean energy projects, prepare the market for substantial improvements in the energy code, and recognize NYC industry leaders	MOS		(\$)\$(\$)	(\$)\$(\$)\$(\$)
 Create a Property Assessed Clean Energy (PACE) program for NYC to enable more energy efficiency and clean energy projects	MOS		(\$)	(\$)\$(\$)\$(\$)
 Reduce congestion and vehicle miles traveled, including by supporting improvements to the subway and bus systems, doubling the number of active cyclists by 2020 through the development of new miles of protected bike lanes and expanded bike share, supporting shared mobility options, expanding smart parking policy, and exploring the implementation of low emission zones	DOT & MOS		(\$)\$	(\$)\$(\$)\$(\$)

GROWTH EQUITY SUSTAINABILITY RESILIENCY

QUALITY JOBS	ECONOMY AND INNOVATION	WORKFORCE DEVELOPMENT	LONG-TERM COST SAVINGS	HEALTH AND WELLBEING	SAFETY	AFFORDABILITY	ACCESS	COMMUNITY	LEAD BY EXAMPLE	RESILIENCY	RELIABILITY	NATURAL CAPITAL
												
												
												
												

SPOTLIGHT: ACCESS AND SAFETY

REDUCING INJURIES BY EXPANDING THE BICYCLE NETWORK



DOT has identified 10 priority bicycle districts, which have comparatively high numbers of cyclists killed or severely injured (KSI) and comparatively low access to the existing bicycle network. By expanding the bike lane network, the City can promote cycling and support Vision Zero, the multi-agency effort to eliminate traffic injuries and fatalities. For example, after DOT installed the protected bike lane on 9th Avenue in Manhattan, total injuries to all road users decreased by 53 percent.²

SPOTLIGHT: ECONOMY AND INNOVATION

Two years after the introduction of a bike lane on 9th Avenue (between 23rd St and 31st St in Manhattan) retailers along the corridor experienced a 47 percent increase in sales compared to that of only 27 percent by other retailer corridors in the neighborhood.

	ACTION	LEAD	GHG REDUCTIONS	CITY INVESTMENT	NON-CITY INVESTMENT
REDUCED AND MORE EFFICIENT CONSUMPTION	Accelerate the diversion of organics from landfills by launching a food waste reduction education program, expanding the organics program to serve all New Yorkers, and enabling the separation of all food waste	DSNY		\$\$\$	\$
	Enhance curbside collection in NYC by implementing a zone-based system for commercial waste, offering single-stream recycling, and developing a blueprint for a Save-as-You-Throw program	DSNY		\$\$\$	not assessed
TRANSITION TO CLEAN ENERGY	Catalyze adoption of high-efficiency electric heat and hot water systems paired with appropriate efficiency measures in buildings through policies and programs	MOS		\$	\$\$\$
	Conduct a study in partnership with local electric and gas utilities on a utility transition plan to achieve 80 x 50, including potential impacts to electricity demand and the natural gas system	MOS		\$	not assessed
	Leverage City-owned property and land to foster innovation in renewable energy development to mitigate climate change and enhance resiliency, air quality, and health outcomes	DCAS & EDC		\$\$	\$
	Promote the development of community energy projects, including microgrids and district systems, to provide social, environmental, and economic benefits	ORR		\$	not assessed
	Explore approaches to pool purchasing power of NYC residents and businesses to procure renewable electricity	MOS & DCAS		\$	not assessed

GROWTH EQUITY SUSTAINABILITY RESILIENCY

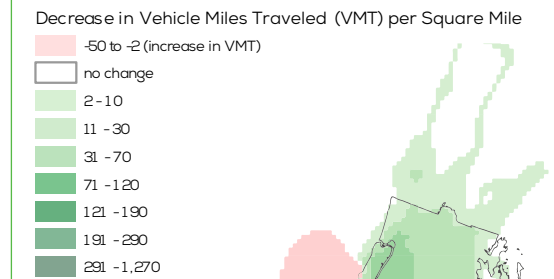
QUALITY JOBS	ECONOMY AND INNOVATION	WORKFORCE DEVELOPMENT	LONG-TERM COST SAVINGS	HEALTH AND WELLBEING	SAFETY	AFFORDABILITY	ACCESS	COMMUNITY	LEAD BY EXAMPLE	RESILIENCY	RELIABILITY	NATURAL CAPITAL
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SPOTLIGHT: HEALTH, WELLBEING, AND ACCESS

Organics collection bins are rodent resistant. The expansion of the organics program will reduce the number of rats and vermin on streets and in buildings, improving quality of life for New Yorkers.

SPOTLIGHT: HEALTH AND WELLBEING















REDUCING IMPACTS OF TRUCK TRAFFIC



Source: NYC Department of Sanitation

Commercial waste collection zones can reduce associated truck traffic by up to 68 percent, which will reduce noise pollution and congestion, and improve air quality.

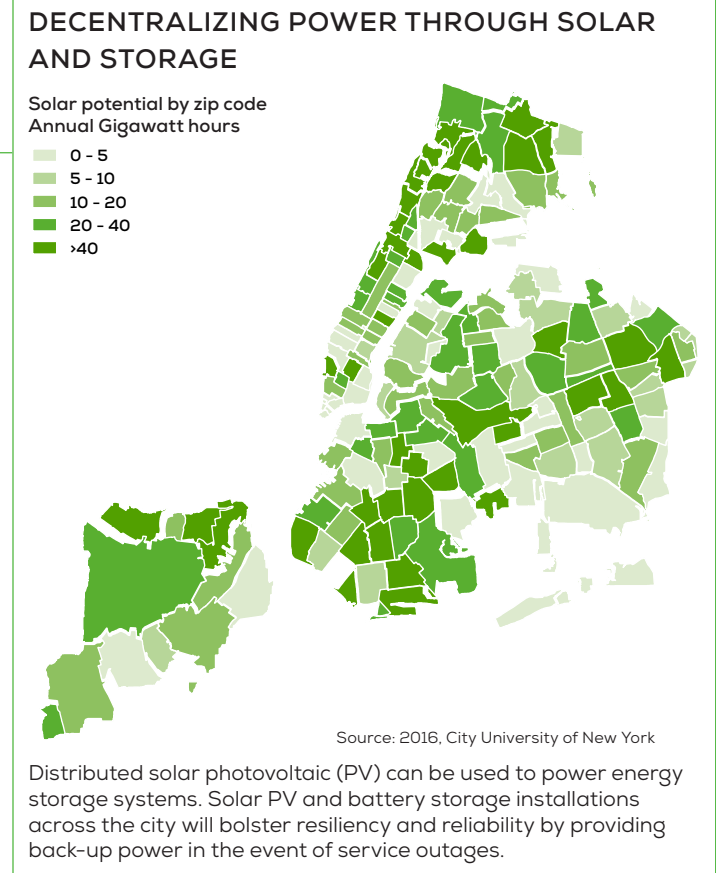
TRANSITION TO CLEAN ENERGY

ACTION	LEAD	GHG REDUCTIONS	CITY INVESTMENT	NON-CITY INVESTMENT
 Create a more favorable environment for solar and storage projects	CUNY, EDC & MOS		(\$ \$)	not assessed
 Advocate for increased generation and transmission of renewable energy into NYC	MOS		(\$)	not assessed
 Use the City's purchasing power to ultimately procure 100% renewable electricity for City operations	MOS & DCAS		(\$ \$ \$)	(\$)
 Advocate for investments that improve the flexibility of in-city transmission and distribution systems to reduce GHG emissions from in-city power plants	MOS		(\$)	not assessed
 Transition away from direct combustion of fossil fuels by encouraging accelerated adoption of cleaner and more efficient vehicle technologies, including by investing in new electric vehicle charging infrastructure throughout the city	DOT, EDC & MOS		(\$ \$)	(\$ \$)
 Achieve a 50% reduction in fossil fuel consumption in the City's vehicle fleet by 2025 by continuing to upgrade and replace with clean fuel vehicles	DCAS		(\$ \$)	(\$)
 Expand capacity for material and renewable energy recovery at water supply and wastewater treatment facilities, including by optimizing biogas production for beneficial use, expanding food waste co-digestion opportunities, and moving toward net-zero energy at all in-city wastewater treatment plants while reducing fugitive emissions and landfilling of biosolids	DEP		(\$ \$ \$ \$)	not assessed

GROWTH EQUITY SUSTAINABILITY RESILIENCY

QUALITY JOBS	ECONOMY AND INNOVATION	WORKFORCE DEVELOPMENT	LONG-TERM COST SAVINGS	HEALTH AND WELLBEING	SAFETY	AFFORDABILITY	ACCESS	COMMUNITY	LEAD BY EXAMPLE	RESILIENCY	RELIABILITY	NATURAL CAPITAL
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SPOTLIGHT: RESILIENCY AND RELIABILITY



CLIMATE CHANGE LEADERSHIP

ACTION	LEAD	GHG REDUCTIONS	CITY INVESTMENT	NON-CITY INVESTMENT
Further climate change communications to reach and engage more New Yorkers	MOS		\$	\$
Lead in the development of a global protocol for cities to attain carbon neutrality by 2050 in collaboration with other vanguard cities and partners	MOS		\$	not assessed
Assess consumption-based GHG accounting methods to complement the current greenhouse gas inventory methodology	MOS		\$	\$
Partner with manufacturers and industry stakeholders to ensure availability and competitive pricing of high-efficiency construction materials, renewable energy technologies, and energy efficiency technologies	MOS & EDC		\$	not assessed
Collaborate with City agencies, universities, unions, and trade organizations to ensure that the NYC workforce is prepared to deliver on climate objectives	MOS, SBS & DCAS		\$ \$	\$ \$
Actively participate in the New York Independent System Operator's (NYISO) exploration of carbon pricing in electricity markets and continue to advocate for aggressive federal regulation of carbon	MOS		\$	not assessed
Incorporate additional GHG emissions reduction efforts into neighborhood-level planning or large-scale developments where suitable opportunities exist	DCP		\$	not assessed

GROWTH EQUITY SUSTAINABILITY RESILIENCY

QUALITY JOBS	ECONOMY AND INNOVATION	WORKFORCE DEVELOPMENT	LONG-TERM COST SAVINGS	HEALTH AND WELLBEING	SAFETY	AFFORDABILITY	ACCESS	COMMUNITY	LEAD BY EXAMPLE	RESILIENCY	RELIABILITY	NATURAL CAPITAL

SPOTLIGHT: LEADING BY EXAMPLE

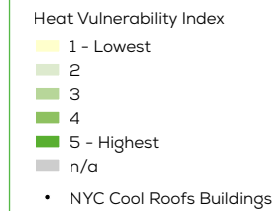


NYC is the first city to release a Paris Agreement-compatible climate action plan. Additionally, the City is working with C40 Cities around the world to develop a global protocol for cities to achieve carbon neutrality by 2050. C40 partner cities include: Boston, Durban, London, Los Angeles, Melbourne, Mexico City, and Paris.

SPOTLIGHT: WORKFORCE DEVELOPMENT, RESILIENCY AND NATURAL CAPITAL

MITIGATING HEAT ISLAND EFFECT

The Heat Vulnerability Index (HVI) is a measure of how at risk a neighborhood is during extreme heat compared to other neighborhoods.



Source: CoolRoofs - 2014, Department of Buildings; Heat Vulnerability Index - 2010, NYC Department of Health & Mental Hygiene

The Department of Small Business Services (SBS) is providing local job seekers with training and work experience, delivering on the mayor's promise to train 3,000 workers with new skills needed for the emerging green economy. Through SBS' NYC CoolRoofs initiative, these workers have gained skills to mitigate the urban heat island effect.

GHG Impact of 2020 Climate Actions

Actions NYC must take by 2020 have prolonged impacts to 2030 and beyond.

1 NECESSARY NEAR-TERM ACTIONS WITH MEASURABLE GHG IMPACT

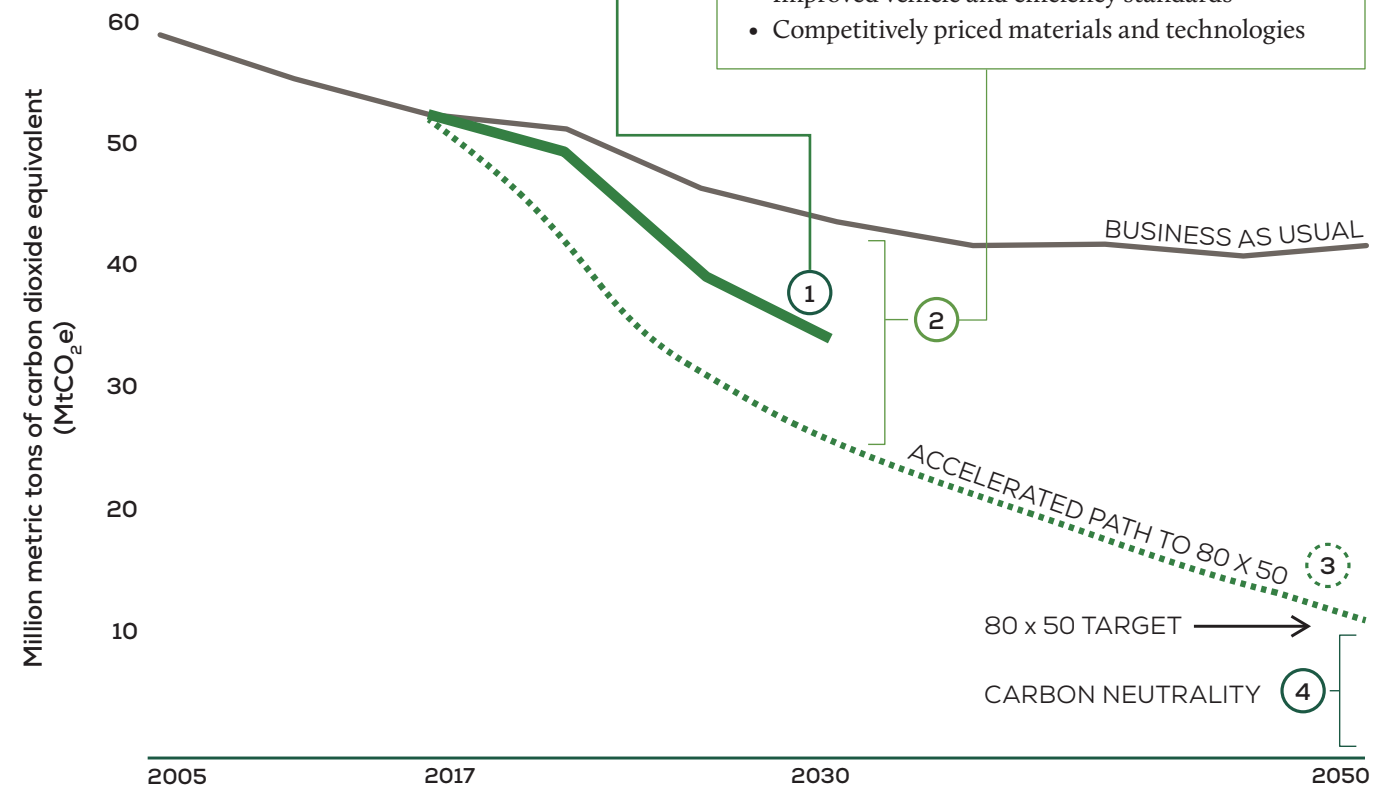
This plan includes 16 near-term actions with associated GHG reductions that can be measured. These actions will result in an estimated 10 million metric tons of CO₂e reductions by 2030. Examples include:

- Building energy performance mandates
- Advanced building codes
- 100% renewable electricity in City operations
- Electric vehicle (EV) infrastructure
- Sustainable transportation
- Organics separation

2 NECESSARY NEAR-TERM ACTIONS THAT ENABLE, ACCELERATE, OR MULTIPLY GHG REDUCTIONS

With the measurable near-term actions alone, NYC will not achieve the GHG reductions necessary to be on an accelerated 80 x 50 trajectory that aligns with a 1.5 degree outcome. The remaining 15 near-term actions will enable, accelerate, or multiply GHG reductions to push NYC closer to the accelerated trajectory. Examples include:

- Carbon pricing
- Enhanced climate change communications
- Workforce able to deliver climate objectives
- PACE financing program
- Improved vehicle and efficiency standards
- Competitively priced materials and technologies



3 ACCELERATED PATH TO 80X50

Reaching the City's long-term climate objectives will require persistent effort and constant reevaluation of progress and strategies.

4 CARBON NEUTRALITY

The development of a global cities protocol for carbon neutrality will inform how NYC can reach carbon neutrality through offsetting remaining emissions after all technically feasible in-city emission reductions are achieved.



Implementing 2020 Climate Actions

While actions and targets are critical to ensuring the City accelerates GHG emissions reductions, it is equally critical that the City implements actions in an equitable, collaborative, and integrated manner. NYC will contribute to improved security and quality of life for all generations by taking the lead with other cities to ensure an environmentally and economically just future while endeavoring to meet a 1.5 degree Celsius outcome.

CLIMATE JUSTICE

Actions that contribute to GHG reductions can have a positive impact on addressing environmental justice and social equity. NYC is committed to ensuring that the benefits of climate action achieve just and equitable outcomes for all New Yorkers. For example, the City will prioritize carrying out actions that will improve local air quality in neighborhoods that bear the greatest burdens from localized air pollution. The City will also carefully consider risks, such as potential impacts to housing affordability and access, and seek to minimize those risks, wherever possible.

NYC works best when New Yorkers have a say in decisions that are made in their communities. Broad and deep public engagement is the City's commitment. Across all five boroughs, the City seeks out community members, elected officials, community boards, academic institutions, businesses, and other stakeholders to ensure that our work to address climate change is anchored to community priorities and needs.

Under Local Laws 60 and 64 of 2017, the City is convening an inter-agency working group to

develop agency-specific plans to address and mitigate environmental justice impacts. Through this work, the City will better align efforts to address climate change with those to address disparate environmental conditions that have historically resulted in diminished health outcomes, economic opportunities, and quality of life. This work will be supported by an independent advisory board of environmental justice stakeholders who provide guidance to the City's efforts.

PLANNING SPATIALLY

NYC is uniquely vulnerable to the impacts of a changing climate, particularly with regard to sea level rise, flooding, and heat events – and those climate risks are not equal across the five boroughs. In many instances, low-income New Yorkers are located in areas that are prone to flooding or are most heat-vulnerable as a result of centuries of land use and development decisions, including historically discriminatory housing and investment practices.

In order to support sustainability and resiliency efforts, particularly for vulnerable populations and neighborhoods, the City will reduce exposure to climate risks and environmental degradation, and enable recovery efforts by employing spatial analysis and reporting. For example, the *Cool Neighborhoods NYC* program addresses the effects of heat waves, rising summer temperatures, and the urban heat island effect targeting the most at-risk communities across the city. *Cool Neighborhoods NYC* is a \$106 million program designed to help keep New Yorkers safe during hot weather and uses an equity and public health approach to climate change mitigation and adaptation planning.



INTEGRATING RESILIENCY AND ADAPTATION



The 2020 climate actions will also have a positive impact on NYC's ability to adapt to the effects of climate change.

Consuming less energy in buildings and transportation by retrofitting public and private buildings and increasing transit ridership and cycling will reduce stress on existing energy infrastructure and supply chains. While mitigating GHG emissions, building retrofits can also demonstrate resiliency benefits, through insulated walls and reinforced windows, as well as boiler and heat pump upgrades paired with flood-proofing strategies. Increasing the diversity of local, clean distributed-power sources and new, low carbon transportation options will provide flexibility in the energy and transportation systems. Reducing waste generated, increasing recycling, and removing organics from the waste stream reduces truck traffic, associated emissions from waste collection, and the City's reliance on out-of-state landfills.

We Can't Do It On Our Own

New York City will not achieve 80 x 50, carbon neutrality, or a 1.5 degree Celsius outcome on its own. Cities, states, the federal government, and international partners must work together in the near- and long-term to uphold the Paris Agreement. NYC has a rich history of collaborating with local, regional, and global allies and is now calling on those partnerships to achieve its climate goals.

NEW YORKERS

ENERGIZING NYC RESIDENTS

We must draw on the passion, ingenuity, and ability of New Yorkers to accelerate progress. Together, we are capable of reinventing our city to be climate-safe, more equitable, prosperous, and exciting. New Yorkers must be empowered and are an important part of the solution if we are to succeed in meeting our ambitious goals.

PRIVATE SECTOR

ACCELERATING AVAILABILITY OF TECHNOLOGY

Advancements in energy storage, clean fuel vehicles, renewable heating and cooling technologies, and other innovations that enable GHG reductions are instrumental to achieving our goals. This includes the engineering that will improve the efficiency and cost-effectiveness of these products, as well as the development of supply chains and a workforce that is prepared to deploy these technologies within NYC.

NEW YORK STATE

CLEANING THE GRID MORE RAPIDLY

State and federal authorities have taken important steps in recent years toward a renewables-based electricity grid, including through the Clean Energy Standard and the Clean Power Plan, and those efforts need to be protected and accelerated. The impending closure of the Indian Point Energy Center, which currently supplies roughly a quarter of the electricity consumed in NYC, amplifies the need to increase large-scale renewable energy generation

and distribution. The State and utilities must also transition to a more reliable, flexible, and “smarter” grid, capable of adding new, intermittent, renewable power sources and build new transmission to bring upstate renewable power into the city.

IMPROVING TRANSIT NETWORKS MORE RAPIDLY

In recent decades, improvements to NYC's transit networks have occurred incrementally and often are de-prioritized in favor of more acute state-of-good-repair work. In order to achieve a large-scale shift to sustainable transportation modes, the City and State must accelerate upgrades to enhance the quality, reliability, capacity, safety, and extent of our subway, bus, ferry, and rail networks. Improvements have historically not kept pace with growth and must be accelerated to achieve GHG reduction goals.

NATIONAL LEADERSHIP

IMPLEMENTING POLICIES THAT ACCELERATE CLIMATE ACTION

The federal government must uphold and expand policies that reflect the benefits of reducing GHG emissions on physical, social, and economic systems. Through the incorporation of the social cost of carbon into decisions about energy production and consumption, policymakers would further encourage clean and renewable energy.

PRIORITIZING CLIMATE ACTION AS AN URGENT, ESSENTIAL PROBLEM

Policymakers are constantly confronted with social, economic, and environmental challenges which impact the lives and livelihoods of Americans. However, climate change is the greatest challenge of our generation, and it must be continually prioritized and communicated as an urgent, essential problem from the top down. We cannot afford to postpone climate action, as it is vital to the long-term sustainability of NYC and the world.

GLOBAL ALLIES

DEVELOPING THE PATH TO CARBON NEUTRALITY

To attain a path to carbon neutrality, cities will need to consider the role of carbon sequestration, the capture and long-term storage of atmospheric carbon dioxide, as well as carbon offsets to account for residual emissions that are not possible to eliminate. NYC will lead in the development of a global protocol for cities to attain carbon neutrality by 2050 in partnership with other leading cities and partners.

Conclusion


The decision to pull the United States out of the Paris Climate Agreement put millions of Americans at risk and is an assault on the public health, safety, and security of everyone on the planet. For the time being, the mantle of leadership in our country has passed to cities and states to fight climate change. Local governments all over the country are going to have to reach further and faster to address the climate crisis.


NYC's commitment to the Paris Agreement through Executive Order 26 is a significant undertaking. The actions presented in this plan will catalyze and enable the immediate and steep decline in GHG emissions in the near- and long-terms while creating a more equitable, resilient, and prosperous city for all New Yorkers. The next three years are critical to getting on track to avoid the worst impacts of climate change. Together, we can and must succeed in this effort.

WHAT ELSE NEEDS TO HAPPEN

In order to align with the Paris Agreement, NYC must continue to take bold actions beyond 2020 to achieve the strategies outlined in *New York City's Roadmap to 80 x 50* at an accelerated pace.


REDUCED AND MORE EFFICIENT CONSUMPTION


 Complete deep energy retrofits that achieve more than 50% reduction in energy use, on average, in all of the city's one million buildings


 Shift away from personal vehicle use and toward commuter rail, subway, buses, ferries, bikes, and walking, achieving an 80% sustainable mode share, with New Yorkers taking 4 out of every 5 trips by foot, bicycle, or public transit


 Achieve zero waste to landfill

TRANSITION TO CLEAN ENERGY

 Transition away from fossil fuel use for heating and hot water production in the majority of buildings

 Transition to a renewables-based electricity supply with a minimum of 70% of NYC electricity derived from renewable sources

 Maximize on-site renewable energy installations across public and private properties

 Transition to zero-emission vehicles and low-carbon fuels

CLIMATE CHANGE LEADERSHIP

 Develop strategies to achieve carbon neutrality by 2050

Appendix I - Agency Highlights

Agencies across the City are working together to highlight the actions and commitments they're taking to reduce their GHG emissions and demonstrate their leadership on climate change. While this is not a comprehensive list, it demonstrates what can be achieved when agencies work together and incorporate climate change mitigation and adaptation strategies in their missions and operations.

CLIMATE POLICY AND PROGRAMS

As a unit of the NYC Mayor's Office, Climate Policy and Programs is leading the City's program for integrated climate actions and includes the Office of Sustainability, the Office of Recovery and Resiliency, and the Office of Environmental Coordination. The Climate Policy and Programs team is working in partnership with other City agencies to dramatically reduce NYC's contribution to climate change, while also aggressively working to protect our neighborhoods against its impacts.

Through Executive Order 26, DCAS has led all City agencies in the development of City building and vehicle-specific climate action plans that will serve as the basis for energy and GHG emissions reductions.

DEPARTMENT OF CITYWIDE ADMINISTRATIVE SERVICES

DCAS Energy Management is leading by example through the accelerated implementation of the \$2.7 billion deep energy retrofits program across agency buildings to help achieve 80 x 50. The City is introducing a new commitment to further reduce energy consumption in municipal buildings 20 percent by 2025, in addition to the clean energy initiatives DCAS is undertaking. Per Executive Order 26, DCAS has already begun to develop detailed agency-specific climate action plans. This fall, 50 new rooftop solar installation designs will be initiated, 33 of which will be evaluated for energy storage. With the completion of these sites in 2019, there will be nearly 200 municipal solar installations — bringing the City to over a quarter of its 100MW solar goal. In addition, the City is committed to ultimately procuring 100 percent renewable electricity for municipal operations. Additional agency and citywide carbon reduction initiatives include DCAS' Citywide Fleet commitment to achieve a 50 percent reduction in fossil fuel consumption in the City's vehicle fleet by 2025.

DEPARTMENT OF TRANSPORTATION

DOT is lowering GHG emissions while improving mobility and enhancing the safety and health of New Yorkers. DOT's top priorities include: improving bus speeds; doubling the number of active cyclists by 2020; expanding the bike lane network by 50 miles per year; implementing data-driven parking and traffic-optimization technology for more efficient traffic; expanding the Off-Hour Delivery program to reduce peak period congestion; facilitating the adoption of low-emission private freight vehicles; and increasing the energy efficiency and sustainability of agency operations and facilities.

DEPARTMENT OF SANITATION

DSNY is pursuing policies to address each component of the City's waste stream. The dramatically expanded organics program is now the largest in the nation, serving more than 2.5 million residents citywide. Through a combination of curbside collection and convenient drop-off sites, the organics program is expected to serve all New Yorkers by the end of 2018. DSNY is also working to reduce GHG emissions in its vehicle fleet and at over 100 facilities across the city. Over the last decade, DSNY has displaced more than seven million gallons of traditional petroleum-based diesel fuel with biodiesel. DSNY is committed to the goal of sending zero waste to landfills by 2030.

DEPARTMENT OF HEALTH AND MENTAL HYGIENE

DOHMH is collecting and analyzing data on climate change and climate-related health outcomes and is integrating climate change risk and vulnerability assessments into its emergency preparedness activities, with an emphasis on how these threats will impact health disparities and exacerbate existing inequities. This evidence-based empirical data draws on the nexus between climate and health issues, informing efforts to prevent or mitigate adverse health outcomes, and directs resiliency resources to communities that are most impacted.

NEW YORK CITY ECONOMIC DEVELOPMENT CORPORATION

EDC is pioneering clean energy and energy storage projects throughout the five boroughs. One of the City's first solar and storage projects launched at the Brooklyn Army Terminal in 2015. A feasibility assessment is underway for a resilient energy pilot project in Hunts Point with a microgrid and solar and storage system. Through the RISE: NYC program, which focuses on climate resiliency for NYC's small businesses, EDC and program partners are installing building-scale nanogrids at approximately 50 small businesses throughout the city. Through Solarize NYC, EDC is reducing the cost for New Yorkers to go solar by expanding group purchasing. EDC's Shore Power system at the Brooklyn Cruise Terminal enables ships to connect to the electrical grid and turn off high-sulfur diesel fuel engines while docked. EDC is also exploring the development of a retail alternative fueling facility in Hunts Point to offer alternative fuels (compressed natural gas, biodiesel, ethanol, and truck stop electrification positions) to reduce pollution from diesel truck traffic.

NEW YORK CITY HOUSING AUTHORITY

NYCHA is creating healthy and comfortable homes to withstand the challenges of climate change and is participating in the NYC Carbon Challenge, which commits NYCHA to a 30 percent reduction of GHG emissions by 2027. In order to meet this target, NYCHA is reducing energy use per square foot 20 percent by 2025 and installing 25MW of solar capacity by 2026. In existing multifamily buildings, NYCHA is installing LED lights, upgrading ventilation, modernizing heating and hot water systems, and piloting new distributed generation technology. These efforts are integral to NextGeneration NYCHA, the Authority's 10-year strategic agenda to preserve public housing.

DEPARTMENT OF SMALL BUSINESS SERVICES

SBS is developing the workforce needed to achieve 80 x 50 and delivering on the mayor's promise to train 3,000 workers with new skills needed for the emerging green economy through a partnership with the NYC Green Jobs Corps and the Buildings Construction Trades Council. Through the NYC CoolRoofs initiative, SBS is providing local job seekers with training and work experience in the installation of energy-saving reflective rooftops. SBS is committed to expanding services for immigrant populations and women entrepreneurs as well as increasing equitable access to economic opportunities for New Yorkers in need of services.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEP is developing an agency-wide energy plan that will determine the most economically, operationally, technologically feasible, and innovative pathways forward in meeting the City's OneNYC goals. DEP will integrate this energy plan with capital planning in order to protect public health and the environment. Since 2006, DEP has reduced its GHG emissions by 21 percent. DEP is also focusing on improving climate resiliency through green infrastructure opportunities to retrofit wastewater treatment plants for storm surge and sea level rise, and incorporating conservation efforts to mitigate droughts and flooding events in the watershed.

HOUSING PRESERVATION & DEVELOPMENT

HPD is continuing to lead the way on integrating housing and climate policy by scaling approaches that provide deeper health, affordability, and energy benefits to tenants and building owners. In 2011, HPD required all new construction and substantial renovations to comply with evolving green building standards. This was followed by the launch of the Green Physical Needs Assessment tool in 2015, which incorporates energy efficiency criteria

into all moderate rehabilitations and retrofits. HPD is currently assessing the feasibility of Passive House for multiple residential building typologies in the affordable housing sector.

DEPARTMENT OF CITY PLANNING

DCP is working closely with communities in the coastal floodplain to plan for lasting, sustainable infrastructure that prepares neighborhoods to withstand the effects of climate change. DCP is also working with communities in developing neighborhood planning initiatives that promote mixed-income housing for the city's growing population. Under NY Works, DCP is also working with fellow agencies to promote job creation at transit-accessible centers, such as Downtown Brooklyn and Long Island City, to bring jobs closer to residents, extend the capacity of the existing transit system to serve commuters, and reduce overall GHG emission from transportation. DCP's borough planning offices are in constant conversation with community boards, neighborhood leaders, and the public to identify opportunities for projects or community partnerships that advance sustainability goals.

DEPARTMENT OF DESIGN & CONSTRUCTION

DDC is producing and promoting capital projects that support 80 x 50 by delivering quality public buildings and infrastructure that are essential for a growing, equitable, sustainable, and resilient NYC. DDC is educating agencies about how projects can meet Local Law 31 of 2016 requirements by facilitating energy audits and energy master plans for all capital projects that significantly affect energy use and GHG emissions. Additionally, DDC is integrating operations and maintenance planning, and measurement and verification planning into the capital project design process. DDC is expanding the use of building envelope commissioning to ensure quality construction of durable, air tight, energy efficient building exteriors, and developing a new Construction Excellence program, to ensure that City contractors have the necessary skills to build low-energy facilities.

DEPARTMENT OF BUILDINGS

DOB is advancing the City's vision for safe and sustainable development across NYC through code and zoning regulations and through education and training of the proposed energy code update to achieve greater energy efficiency in buildings. DOB reinforces public safety by strengthening proactive enforcement and strategically deploying enforcement resources. DOB will support better communications and community engagement through the use of DOB NOW, a public facing web interface that allows New Yorkers to conduct transactions online, and through the inclusion of energy code information in project requirements for the construction industry.

NEW YORK CITY FIRE DEPARTMENT

FDNY is working on reducing GHG emissions from ambulances by installing idle-reduction, or stealth, technology and EV charging stations. Currently, the ambulance fleet has stealth technology auxiliary power units, which improve engine idling time, on 26 percent of the fleet and aims to increase to 46 percent of the fleet by 2019. FDNY has completed solar projects and LED upgrades throughout the five boroughs over the past ten years and has installed solar hot water, geothermal, and green roofs in new facilities under construction.

LANDMARKS PRESERVATION COMMISSION

LPC is simplifying the process for gaining approval for interior alterations and energy efficiency measures, such as high performance windows and HVAC equipment, and renewable energy measures, such as solar panels. LPC is also exploring ways to reduce employee energy consumption.

NEW YORK POLICE DEPARTMENT

NYPD is incorporating renewable energy and energy efficiency technology into its real estate portfolio of over

250 facilities. Most recently, in partnership with DDC and DCAS, design was completed on a new facility to be outfitted with rooftop solar PV. NYPD also hired an energy manager to further solidify NYPD's commitment to achieving 80 x 50 by assessing its facilities for energy conservation opportunities.

DEPARTMENT OF EDUCATION AND SCHOOL CONSTRUCTION AUTHORITY

DOE is broadening its outreach about energy and climate change to reach the parents and communities of its over 1.2 million students. DOE's Office of Sustainability is increasing youth leadership around sustainability and expanding its training for educators and facilities staff. DOE is continuing to implement projects that reduce consumption of fossil fuels, including system optimization, weatherization, capital replacements of inefficient and obsolete building systems, and optimized facilities operations and maintenance. DOE accounts for over 25 percent of the City's demand response program and will continue to enroll all viable buildings within its 1,400 buildings, install solar PV where feasible, and implement an energy analytics platform.

SCA is implementing compliance with Local Law 31 of 2016, which requires newly built or majorly retrofitted City buildings to be designed to a very low energy target. SCA is increasing student capacity by building new schools that provide safe, attractive, and environmentally sound spaces through capital improvements for the roughly 1,400 existing NYC public school buildings. SCA is also partnering with other NYC agencies to realize best design, construction, and procurement practices.

TAXI & LIMOUSINE COMMISSION

The TLC is improving the energy efficiency of its facilities in support of 80 x 50. Its Woodside facility will achieve LEED Silver certification by using energy conservation measures such as lighting power reduction, lighting occupancy sensors, and improved glazing. TLC will also install a solar PV array on this facility.

FINANCIAL INFORMATION SERVICES AGENCY – OFFICE OF PAYROLL ADMINISTRATION

FISA-OPA is pursuing an upgrade of office lighting, lighting controls, and mechanical infrastructure to its facility and has reduced its vehicle fleet to three gas powered and two hybrid vehicles. Having implemented a recycling and e-waste program, FISA-OPA is also reducing the amount of print material it uses by encouraging City employees and vendors doing business with the City to sign up for electronic banking and digital reports.

MAYOR'S OFFICE OF LABOR RELATIONS

OLR is enhancing the health and wellbeing of NYC employees through its WorkWell NYC pilot program, with initiatives that often provide sustainability benefits by improving indoor space quality and encouraging walking or biking instead of taking fossil fuel-based transportation. OLR has hosted its first “Bike to Work” day to encourage staff to bike and is aiming to host “food box” programs that would provide farm fresh produce to interested staff. It has also distributed reusable water bottles to its staff and personnel at four other agencies to encourage employees to drink tap water rather than purchase beverages in disposable containers. OLR is seeking to expand these initiatives to other City agencies. In addition, OLR is making efforts to go paperless and digitize files as much as possible.

DEPARTMENT OF CORRECTION

DOC is improving local air quality, reducing energy consumption and GHG emissions, and expanding clean distributed generation. DOC's new combined heat and power (CHP) plant on Rikers Island facility is designed to generate nearly all of the electricity and steam needed to serve Rikers Island, offsetting the electricity demand of about 15,000 residents from the Astoria power grid. Ultimately, the new plant will reduce the facility's GHG emissions by 17 percent and NOx emissions by 37 percent,

provide a savings of over \$6.9M in annual energy cost, increase reliability of the electrical and steam services on Rikers Island, improve resiliency, and create green jobs for project construction. DOC is completing agency-wide lighting upgrades to LEDs, which is expected to reduce energy consumption from lighting by at least 50 percent, and has reduced GHG emissions through energy conservation and retro-commissioning measures to HVAC and steam equipment.

NEW YORK CITY HEALTH AND HOSPITALS

NYC Health + Hospitals is participating in the NYC Carbon Challenge to reduce GHG emissions 50 percent by 2025 from a 2007 baseline. It has already achieved a 24 percent GHG emissions reduction through a range of energy efficiency projects, many of which were conducted jointly with the New York Power Authority. The public health system has plans to install a combined heat and power (CHP) system at NYC Health + Hospitals/Kings County and is making plans for another CHP system at NYC Health + Hospitals/Bellevue, contributing to another 11 percent reduction in GHG emissions by 2020 while improving resiliency.

DEPARTMENT OF PARKS AND RECREATION

Parks is actively working toward a holistic approach to GHG emissions reduction that combines planning and design of new construction projects; retrofitting, retro-commissioning, and upgrading existing systems; preventive and predictive maintenance of equipment; energy monitoring and performance tracking; and training for all levels and aspects of agency operations. Parks' capital program incorporates green infrastructure, high efficiency equipment, building controls, and renewable energy. Parks is retrofitting existing facilities with LED lighting, high-efficiency HVAC equipment, and building and lighting controls; ramping up a performance management program to maximize asset performance; performing intensive data analytics to manage energy usage and verify investments; and building its employee's sustainability awareness and skills through training.

BROOKLYN BRIDGE PARK CORPORATION

BBP is reducing its energy intake by upgrading park lighting to LEDs, adding vacancy sensors at every facility, and installing a large scale solar array at Pier 2. BBP will install building management systems throughout its facilities, which will provide better control over energy usage and reduce waste to landfill.

COMMISSION ON HUMAN RIGHTS

The Commission is enforcing the NYC Human Rights Law, Title 8 of the Administrative Code, through its Law Enforcement Bureau, educating New Yorkers about their rights under the Law, and encouraging positive community relations through its Community Relations Bureau. The Commission's work to achieve the goals of reducing energy consumption and GHG emissions occurs largely through partnership with DCAS.

MAYOR'S OFFICE OF SPECIAL PROJECTS AND COMMUNITY EVENTS

The Mayor's Office of Special Projects and Community Events is stocking its events with compostable and recyclable products that meet the City's Environmentally Preferable Purchasing guidelines. To lead by example, MOSPCE ensures that Mayor de Blasio brings a reusable water bottle to his events, chooses catering with sustainable food practices in mind, selects venues with a consciousness toward energy efficiency, and collaborates with City Harvest to give away leftover food to reduce waste while providing for New Yorkers in need.

NEW YORK PUBLIC LIBRARY

NYPL is renovating many of its facilities to LEED Gold standard to comply with Local Law 31 of 2016 and is committed to achieving the highest environmentally friendly operation at its facilities. Additionally, NYPL acts as a platform for public awareness on climate change and environmental sustainability.

BROOKLYN PUBLIC LIBRARY

BPL is planning to install solar photovoltaic panels at up to five branches, green roofs at two branches, and upgrades to HVAC controls at over 20 branches. In order to achieve 80 x 50, BPL has developed an energy master plan for all of its libraries. BPL has reduced emissions by approximately 15 percent from a 2005 baseline. These gains have primarily been made through LED lighting upgrades completed at 22 branches. BPL's Central Library was the first library in the City to participate in Con Edison's demand response program. This is a vital resiliency measure to help reduce the risk of brownouts and blackouts in Brooklyn neighborhoods. Finally, BPL is educating the public on sustainability through energy efficiency workshops and is planning to expand programming to incorporate solar kiosks and books and exhibits on green infrastructure.

QUEENS LIBRARY

Queens Library is creating public libraries that support health benefits: psychological relaxation and stress alleviation; increased physical activity; and reduced exposure to air pollutants, excess noise, and urban heat island effects. Investment in green infrastructure and clean energy will not only lower the agency's GHG emissions and mitigate flooding, but also preserve the libraries as neighborhood anchors during times of need and sustain the facilities as premiere destinations for information and educational support for all New Yorkers. Its most recent green space projects include collaboration with the Greater Jamaica Development Corporation on the revitalization of the landscaping at the Central Library in Jamaica, Queens, and the much anticipated “Green Wall” project, at the Broadway Community Library. Through DCAS Energy Management programs, Queens Library has invested in LED retrofits at 22 buildings and has also been working with DCAS to install solar PV at two facilities.

MAYOR'S OFFICE FOR INTERNATIONAL AFFAIRS

The Mayor's Office for International Affairs is communicating with the world's largest diplomatic community on a daily basis, where the importance of implementing the Paris Agreement is a central message when discussing policy issues with diplomats living in NYC, as well as delegations visiting from other countries. In line with the Executive Order 26 commitment to develop global partnerships, the Mayor's Office for International Affairs explains how NYC is dedicated to addressing climate change, provides practical examples from sister agencies, and identifies opportunities to share best practices with cities and municipalities around the world.

DEPARTMENT OF CONSUMER AFFAIRS

DCA is running the "Shut the Front Door!" campaign, to encourage compliance with Local Law 92 of 2015, which prohibits stores from leaving doors or windows open while air conditioning is running. As part of this effort, DCA provides educational materials to businesses to help them project cost savings and associated environmental benefits from keeping the door shut.

MAYOR'S OFFICE OF MEDIA AND ENTERTAINMENT

MOME is overseeing *NYC Film Green*, a first-of-its-kind environmental sustainability program for the film and television industry, which offers productions with at least one shooting day in NYC the opportunity to be recognized for their efforts to reduce their impact on the environment. In exchange for tracking basic resource usage (including utilities, fuel, and housing) and satisfying certain sustainability benchmarks in the areas of waste diversion, energy conservation, and crew education, qualifying productions will receive the *NYC Film Green* mark of distinction to place in end credits and any marketing and promotional materials.

DEPARTMENT OF CULTURAL AFFAIRS

DCLA is working with cultural organizations to achieve 80 x 50. Given that over 25 percent of DCLA's funding to cultural organizations goes to support energy costs in City-owned cultural facilities, DCLA is creating a new position that will work with its Capital Projects and Cultural Institutions units to help cultural organizations reduce their energy consumption and associated GHG emissions. Through its Material for the Arts (MFTA) division, DCLA is working with businesses and individuals to redistribute a wide variety of reusable materials to non-profit organizations, city agencies, and public schools to divert these supplies from landfills and to direct them to those who can use them. In 2016, MFTA diverted over 1.9 million pounds of high-quality reusable goods, reducing the GHG impact associated with creating new supplies, and supporting local arts and cultural community throughout the city.

NYC FOOD POLICY

The Office of Food Policy is reducing food insecurity, improving consumption of healthy food among low-income New Yorkers, and building a more sustainable, resilient, and equitable system focused on mitigating the environmental impacts of food, from distribution to consumption to waste management. In support of the City's goal to send zero waste to landfill by 2030, Food Policy is diverting organic waste from landfill through its work with agencies, rescue organizations, food businesses, and residents. NYC agencies are responsible for more than 240 million meals and snacks annually, and Food Policy supports agencies in their food procurement and food service programs to serve nutritious meals and encourages the procurement of sustainable and local products.

CITY UNIVERSITY OF NEW YORK

CUNY is integrating sustainability into the University and surrounding metropolitan area through its curriculum, policy work, research, capital projects, and workforce and economic development activities. CUNY's campuses are offering degrees and programs related to sustainable urban planning and design, as well as technical programs relating to EV and building energy management. CUNY's researchers are focusing on breakthroughs in battery storage and environmental adaptability such as the resiliency of Jamaica Bay. Through Sustainable CUNY, CUNY focuses on three key pillars: operations, maintenance, and energy conservation; renewable energy deployment; and resiliency. The NYC Solar Partnership was formed over a decade ago with CUNY, MOS, and NYCEDC to remove barriers to solar in NYC and has successfully reduced permitting time and grown the market to over 100MW of distributed solar across NYC. CUNY's Smart DG (distributed generation) Hub is a collaborative effort with New York State and City agencies, utilities, and industry to integrate solar and storage into the New York infrastructure.

NYC SERVICE

NYC Service is partnering with City agencies and non-profits in order to mobilize members and volunteers to address environmental issues. Environmental protection is one of NYC Service's five city needs. Priorities and ongoing activities include community outreach on recycling and reducing waste, as well as increasing organics separation. NYC Service is also working to reduce energy and paper use within its office.

OFFICE OF ENVIRONMENTAL REMEDIATION

MOER is expanding its novel materials exchange program to promote local reuse of surplus material resources generated during construction. This will serve

a dual purpose of reducing GHG emissions from truck transportation and provide building materials to construct flood-control structures that improve our resilience to sea level rise. MOER's NYC Clean Soil Bank has exchanged nearly 400,000 tons of clean soil over four years – most of which has been reused to raise the elevation of flood-prone land and build wetlands and berms to improve resiliency. MOER is committing to achieve more equitable distribution of environmental and social benefits of clean soil exchange and will introduce the Progressive Urban Resource Exchange program (PURE Soil) to promote clean soil distribution in low-income communities. MOER will also launch the PURE Soil Dashboard, a web-based application developed in collaboration with 100 Resilient Cities (100RC) and AMEC, to document the use of clean soil in NYC communities. MOER is expanding the use of soil and other materials exchanges by agencies. In doing so it will work with city agencies to standardize specifications for materials usage, educate agency engineers on benefits of materials exchange, and modifying contracts to facilitate use of locally sourced material.

DEPARTMENT OF FINANCE

DOF is providing property data to support NYC's benchmarking laws, as well as aggregated income and expense data to determine the tax revenue impact on mandated fuel reductions by 2030. DOF is replacing its fleet with energy efficient options at lease expiration and participating in the annual citywide Earth Day initiative to reduce non-essential vehicle usage and electricity. DOF is working with DCAS to convert to energy efficient lighting in DOF's long-term lease spaces and encouraging employees to "burn calories not electricity" by taking the stairs where possible. DOF is implementing an aggressive waste recycling program in which employees have bins at their desk for mixed paper, envelopes, magazines, and newspapers only. Bins are provided in centrally located areas in the building for the disposal of food, food wrappers, containers, and recyclables. DOF is also adhering to all e-waste procedures. All expired computer components are collected agency-wide and taken to a warehouse for proper decommissioning and then turned over to an e-waste vendor for disposal in accordance with all state and federal regulations.

ADMINISTRATION FOR CHILDREN'S SERVICES

ACS is expanding transportation options for front-line staff, including transitioning 40 percent of its agency fleet to hybrid and electric vehicles, as well as using car shares in place of dedicated agency vehicles. ACS is working with DOT to reduce the need to circle for parking, leading to less idle time and needless GHG emissions. ACS is also engaged in the DDC capital planning process to elevate energy efficiency as a priority in its largest City-owned facilities at the Children's Center, Horizon Juvenile Detention, and Crossroads Juvenile Detention Center.

NYC EMERGENCY MANAGEMENT

NYCEM is preparing the city for emergencies by educating the public on preparedness for increasingly severe and frequent emergencies as a result of climate change. The Emergency Support Center (ESC) in Bushwick will expand and become LEED-certified, joining its agency headquarter in this distinction. NYCEM is upgrading the HVAC and electrical systems in its third facility, the Backup Emergency Operating Center (BEOC) in Coney Island. Recently, the agency replaced its entire pool fleet with fully electric vehicles and will continue replacing non-emergency vehicles with electric vehicles when funding becomes available.

Appendix II - Executive Order 26

June 2, 2017

WHEREAS, we all have a moral, economic, public health, and security imperative to act to protect our planet, fellow human beings, and future generations; and

WHEREAS, we must act, and act together at every level, as individuals, as cities, and as a global community; and

WHEREAS, climate action taken by cities in the United States and around the world can result in 40% of the pollution reduction needed globally to limit warming to only 1.5 degrees Celsius; and

WHEREAS, the many benefits of climate action by cities also address issues of inequality including the expanding wealth gap, the lack of housing, the accessibility of public transit, aging infrastructure, and other major urban challenges; and

WHEREAS, President Donald Trump's decision to pull out of the Paris Agreement puts millions of Americans at risk and cities like New York City must step up to stop climate change.

NOW, THEREFORE, by virtue of the power vested in me as Mayor of the City of New York, it is hereby ordered:

Commitment to Principles and Goals of Paris Agreement

Section 1. Adopt and Commit to the Principles and Goals Set Forth In the Paris Agreement. To protect our residents and all human beings from the effects of climate change, New York City will adopt the principles and goals of the Paris Agreement to deliver climate actions that are consistent with or greater than its own commitments to reduce its greenhouse gas emissions 80% by 2050 and that support the critical goal of holding the increase in the global average temperature to below 2° Celsius above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5° Celsius above pre-industrial levels, as set forth in the Paris Agreement, which entered into force on November 4, 2016; and

Section 2. Develop New York City's Pathway to Achieving Emissions Reductions Necessary to Contribute its Proportionate Share to Global Efforts to Limit Warming to 1.5 Celsius. The mayor directs city agencies to work with the Mayor's Office of Sustainability (MOS), its national and global climate network partners and other leading cities to develop further greenhouse gas reduction plans and actions that are consistent with the principles and goals of the Paris Agreement and that contribute to global efforts to limit warming to 1.5° Celsius. All City agencies shall work with MOS to create a citywide plan by September 30 to advance the Paris Agreement's goal of limiting global temperature increase to 1.5° Celsius above pre-industrial levels by further reducing their own greenhouse gas emissions; and

Section 3. Global partnership. New York City will commit to acting locally and globally, working with other leading United States cities, and with regional and state partners, business leaders, the faith community, the public health community, scientists, activists, and citizens across our community, these United States, and the world to meet our country's 2016 commitment under the Paris Agreement, to make even more ambitious future commitments to emissions reductions, and to support inclusive, healthy and prosperous communities.

Bill de Blasio,
MAYOR

Appendix III - Inventory of New York City Greenhouse Gas Emissions in 2016

The *Inventory of New York City Greenhouse Gas (GHG) Emissions* is published pursuant to Local Law 22 of 2008 and is composed of two inventories: the Citywide GHG Inventory and the City Government GHG Inventory. These inventories are developed using separate GHG accounting protocols and have overlapping yet distinct scopes and boundaries.

CITYWIDE GHG INVENTORY

GHG emissions in the Citywide Inventory are calculated and reported per the guidance of the Global Protocol for Cities (GPC). This inventory consists of all direct and indirect GHG emissions from:

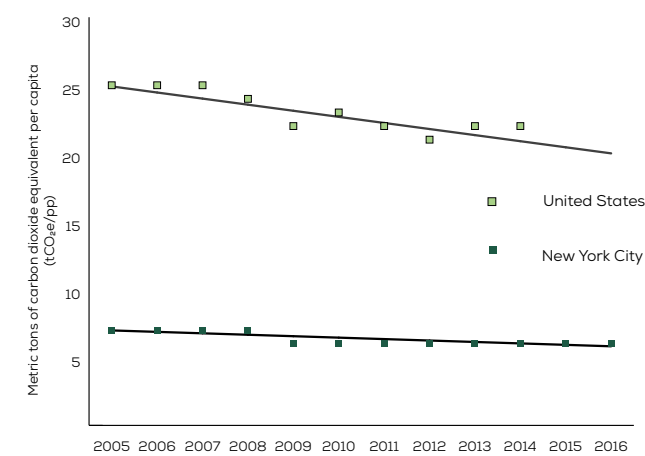
- Energy used by buildings and other stationary sources, and fugitive emissions from natural gas distribution within NYC limits;
- On-road transportation, railways, marine navigation, and aviation within city limits; and
- Wastewater treatment within city limits and solid waste generated within the city but disposed outside of city limits

These sources represent the GPC BASIC level of reporting, which is used to track the City's GHG mitigation goals. The 2016 citywide GHG emissions inventory is GPC BASIC level compliant.

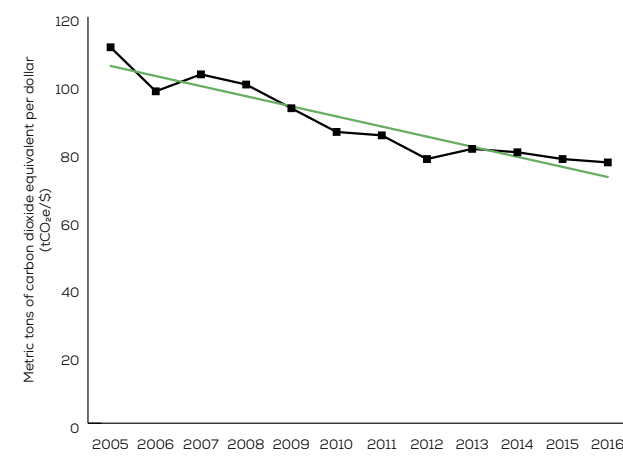
FINDINGS

Citywide GHG emissions in 2016 were 52.1 million metric tons of carbon dioxide equivalent (MtCO₂e). Since 2005, GHG emissions have decreased in NYC citywide by approximately 15% despite significant increases in population and economic activity, NYC's per capita GHG emissions in 2016 was on average of 6.1 metric tons of carbon dioxide equivalent (tCO₂e) emission per capita, significantly lower than the American average of 19 tCO₂e per capita. Citywide GHG emissions have remained flat since 2015.

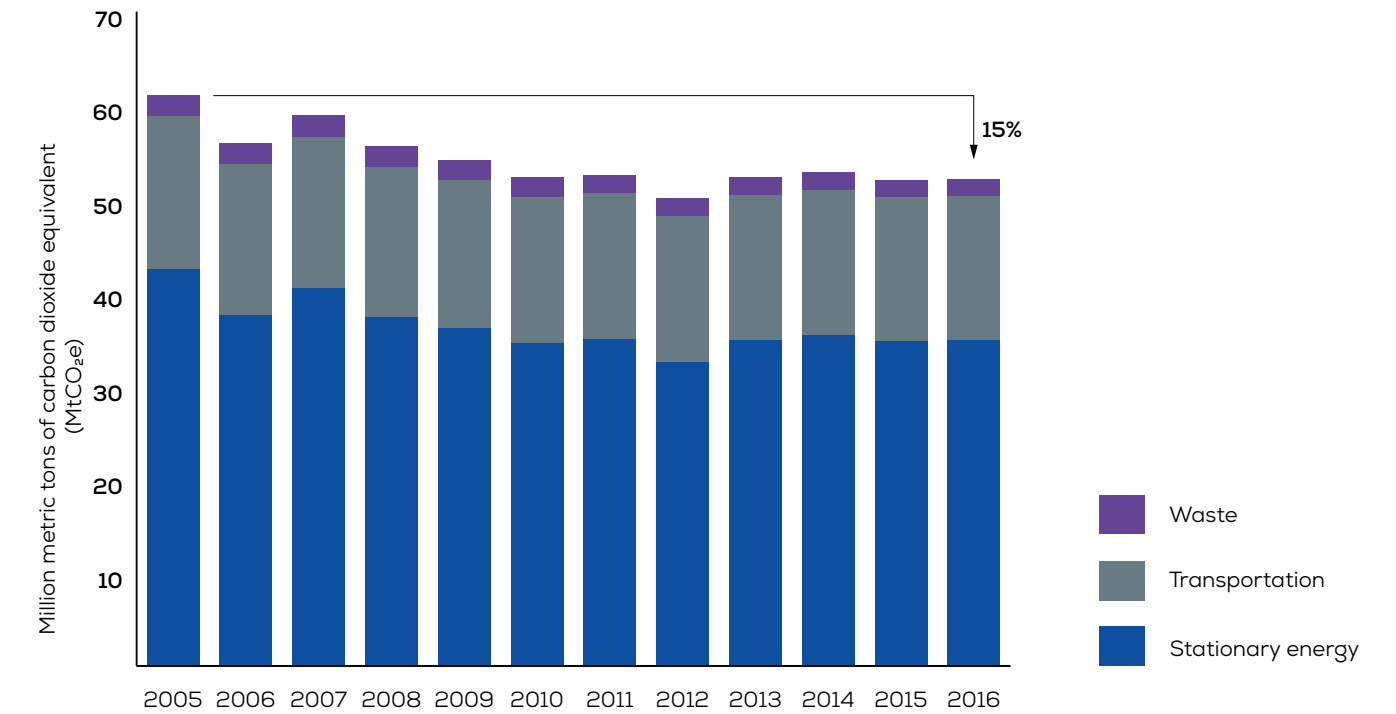
GHG EMISSIONS PER CAPITA 2005 TO 2016



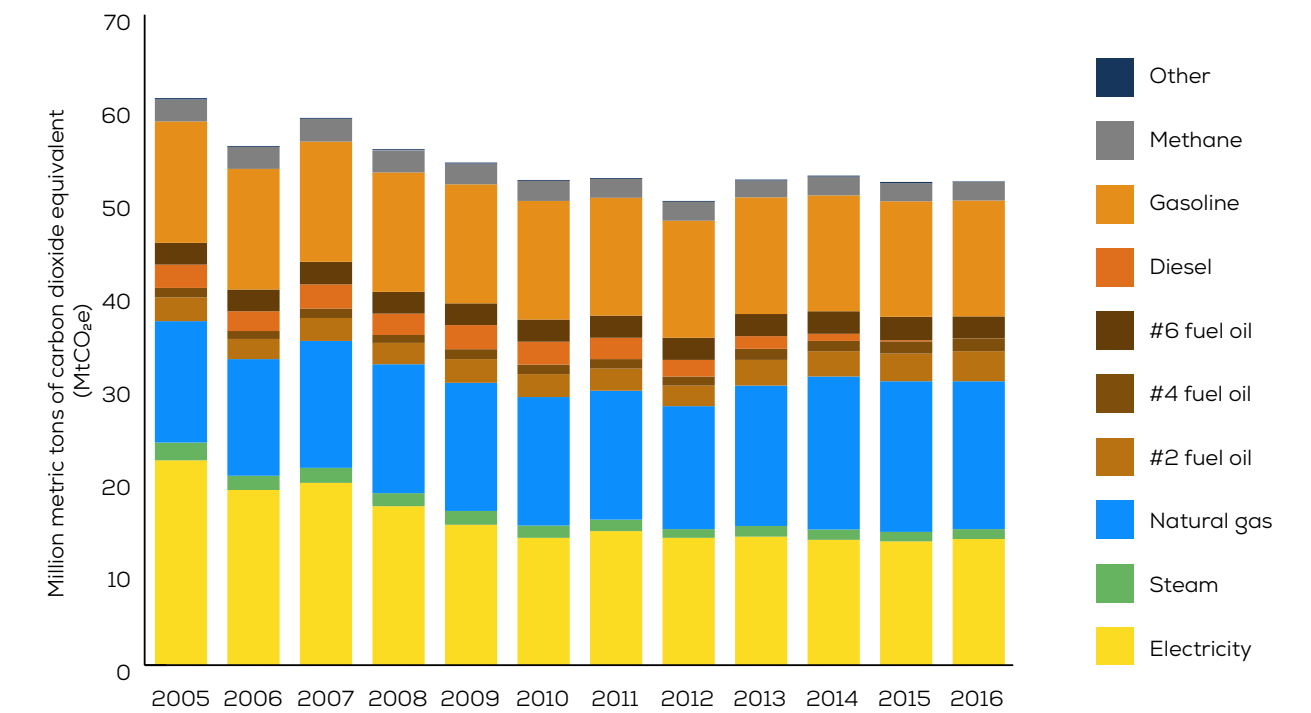
NYC GHG EMISSIONS PER GROSS CITY PRODUCT 2005 TO 2016



CITYWIDE ANNUAL GHG EMISSIONS BY SECTOR



CITYWIDE ANNUAL GHG EMISSIONS BY SOURCE



*GHG emissions from nitrous oxide and jet fuel account for less than 1% of citywide GHG emissions

CONSUMPTION-BASED EMISSIONS

Like other large cities, NYC's vibrant economy drives significant GHG emissions beyond its boundaries.

Consumption-based emissions accounting captures the direct and life cycle GHG emissions from products and services that residents consume. This includes a combination of different emission sources ranging from energy use, transportation, and waste management, to supply chain emissions of goods and services. A city's consumption-based emissions can be described using the following expression:

$$\text{Consumption Emissions} = \text{Production emissions} + \text{Imported emissions} - \text{Exported emissions}$$

In simple terms, a city's accounting of consumption-based emissions is defined as the emissions arising within that

city's boundaries, (-) minus those emissions associated with the production of goods and services exported to meet demand outside the city, (+) plus emissions arising in supply chains for goods and services produced outside the city but imported for consumption by its residents. A consumption-based GHG emissions assessment therefore cuts across Scope 1, 2 and 3 emissions categories, bringing together direct and indirect emissions sources. It reflects complex international supply chains, lifecycle emissions, and is defined by the boundary in which consumption occurs.

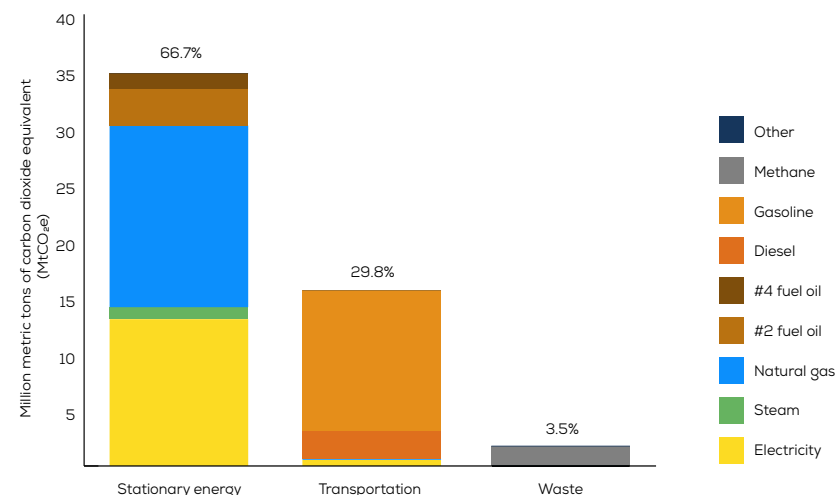
The City will evaluate consumption-based emissions accounting methodologies and their ability to complement the insight provided by the City's sector-based Global Protocol for Community-scale GHG emissions inventory (GPC). Using both approaches may encourage more holistic GHG emissions assessments, provide additional perspective through which to understand NYC's contribution to climate change, and identify additional opportunities for action.

EMISSIONS BY SECTOR

New York citywide GHG emissions come from three key sectors: stationary energy (buildings), transportation, and waste. Buildings continue to be the largest driver, accounting for 67% of total citywide GHG emissions,

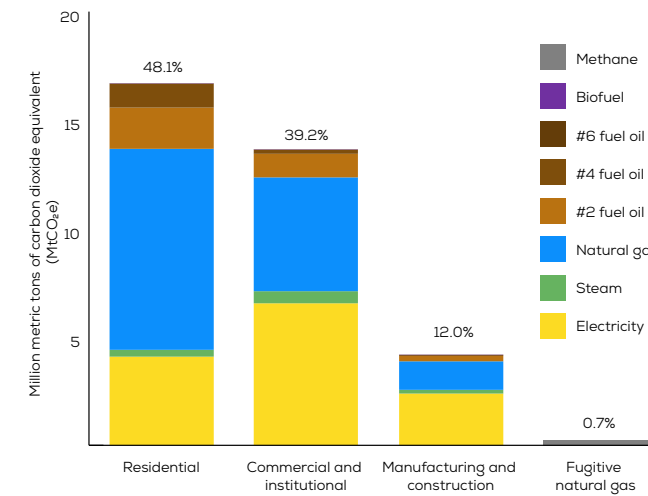
followed by transportation (30%), and waste (3%). The largest sources of GHG emissions in the city are combustion of natural gas (31%), use of electricity (25%) and combustion of gasoline (24%).

2016 CITYWIDE EMISSIONS BY SECTOR AND SOURCE



*GHG emissions from nitrous oxide, #6 fuel oil, and jet fuel account for less than 1% of citywide GHG emissions

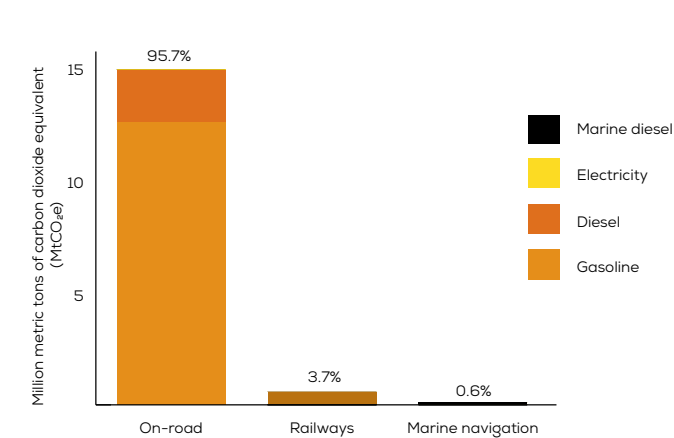
2016 CITYWIDE STATIONARY ENERGY GHG EMISSIONS BY SOURCE



STATIONARY ENERGY

Energy used in our buildings generated 34.7 MtCO₂e in 2016. This sector is by far the largest source of emissions in the City. Residential buildings in NYC account for 48% of building-based emissions, while Commercial buildings in NYC account for 39%. Natural gas combustion is the main contributor from buildings, responsible for 46% of building-based emissions. Use of electricity is the second largest source of emissions, responsible for 37% of building-based emissions.

2016 CITYWIDE TRANSPORTATION GHG EMISSIONS BY SOURCE

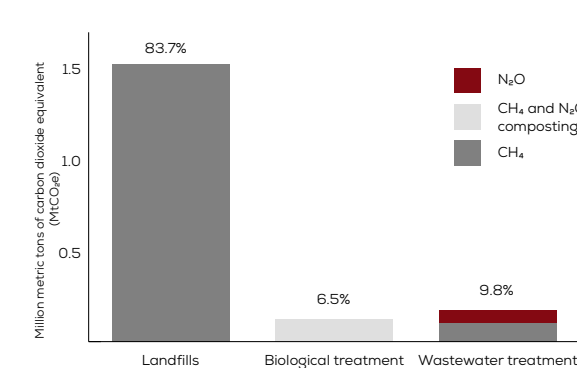


*GHG emissions from diesel hybrid, biofuel, CNG, fuel cell, ethanol, aviation gas, jet fuel, and gasoline hybrid account for less than 1% of citywide GHG emissions

TRANSPORTATION

30% of citywide emissions come from the transportation sector (15.5 MtCO₂e). On-road vehicles are the largest source of emissions from this sector, accounting for 96% of emissions from transportation (29% citywide). Within this sector, vehicles that consume gasoline are the primary source, accounting for 80% of transportation-based emissions.

2016 CITYWIDE WASTE GHG EMISSIONS BY SOURCE



WASTE

Over 3% of citywide emissions come from the waste sector. Methane emissions from landfilled waste is by far the largest source from the waste sector, accounting for 89% of waste-based emissions and 2.9% of citywide emissions.

CITY GOVERNMENT GHG INVENTORY

GHG emissions in the City Government Inventory are calculated and reported per the Local Government Operations Protocol (LGOP). This Inventory reports GHG emissions from operations, facilities, or sources wholly owned by the City, or over which the City has full authority to introduce and implement operations, health and safety, and environmental policies (including both GHG- and non-GHG-related policies). GHG emissions from leased real estate and vehicles and other equipment are included. It is important to note that additional, non-City operated public entities (e.g., Metropolitan Transportation Authority) are not included within the LGOP inventory protocol by this definition of operational control.

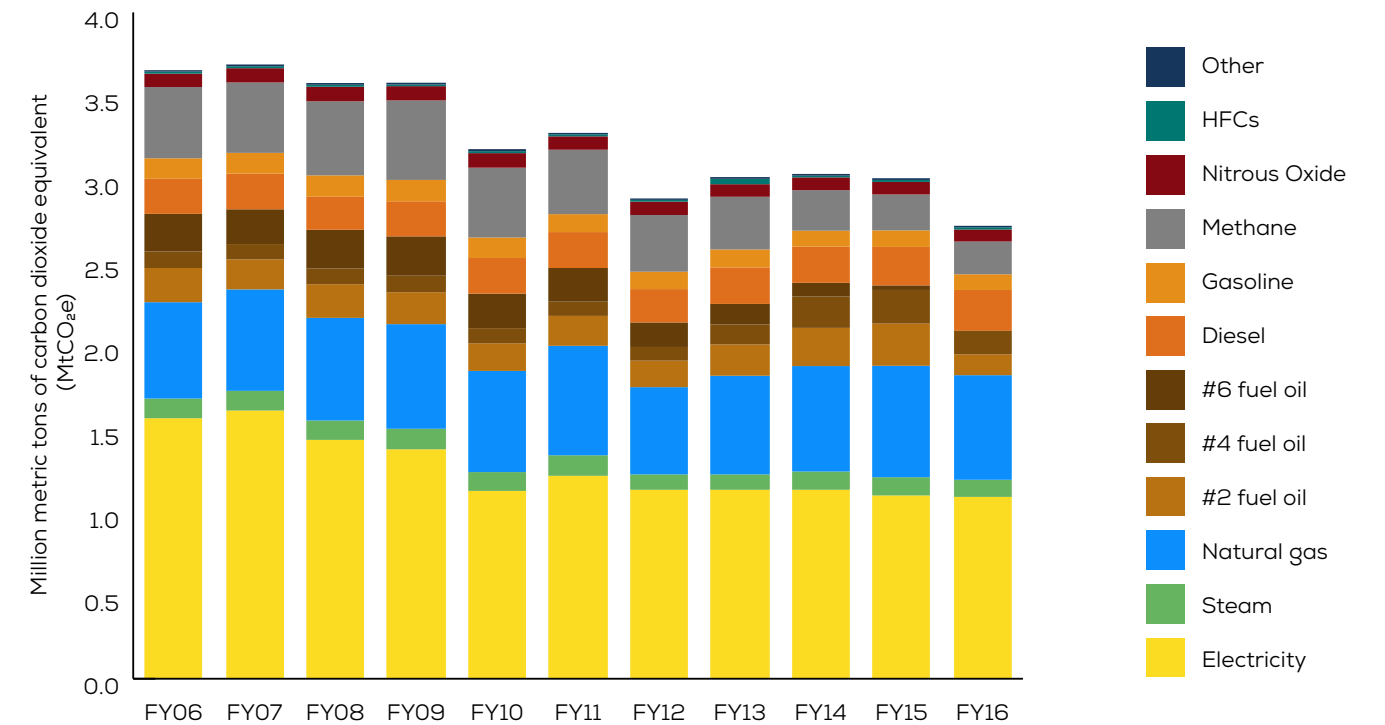
FINDINGS

City Government GHG emissions in 2016 were 2.74 MtCO_{2e}. Since Fiscal Year (FY) 2006, GHG emissions have decreased in NYC government by approximately 25%. City Government GHG emissions have reduced over 8% from FY 2015.

The most significant reductions in GHG emissions in 2016 come from #2, #4, and #6 fuel oils as well as from natural gas. Sizable reductions in emissions have also been observed in methane from the City's wastewater treatment facilities and in electricity consumption in its buildings.

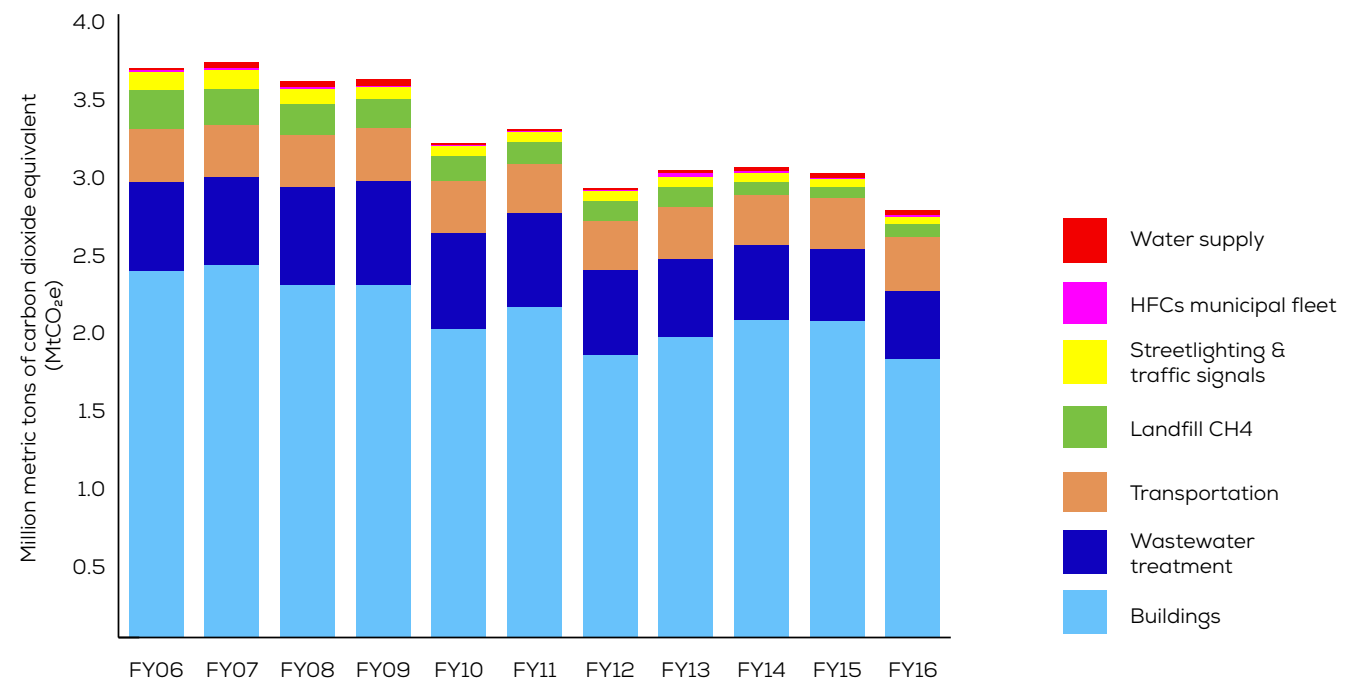
Electricity use is the largest source of emissions, accounting for 40% of City Government emissions. Natural gas combustion is the second largest contributor to emissions the City Government portfolio accounting for 23%.

CITY GOVERNMENT ANNUAL GHG EMISSIONS BY SOURCE

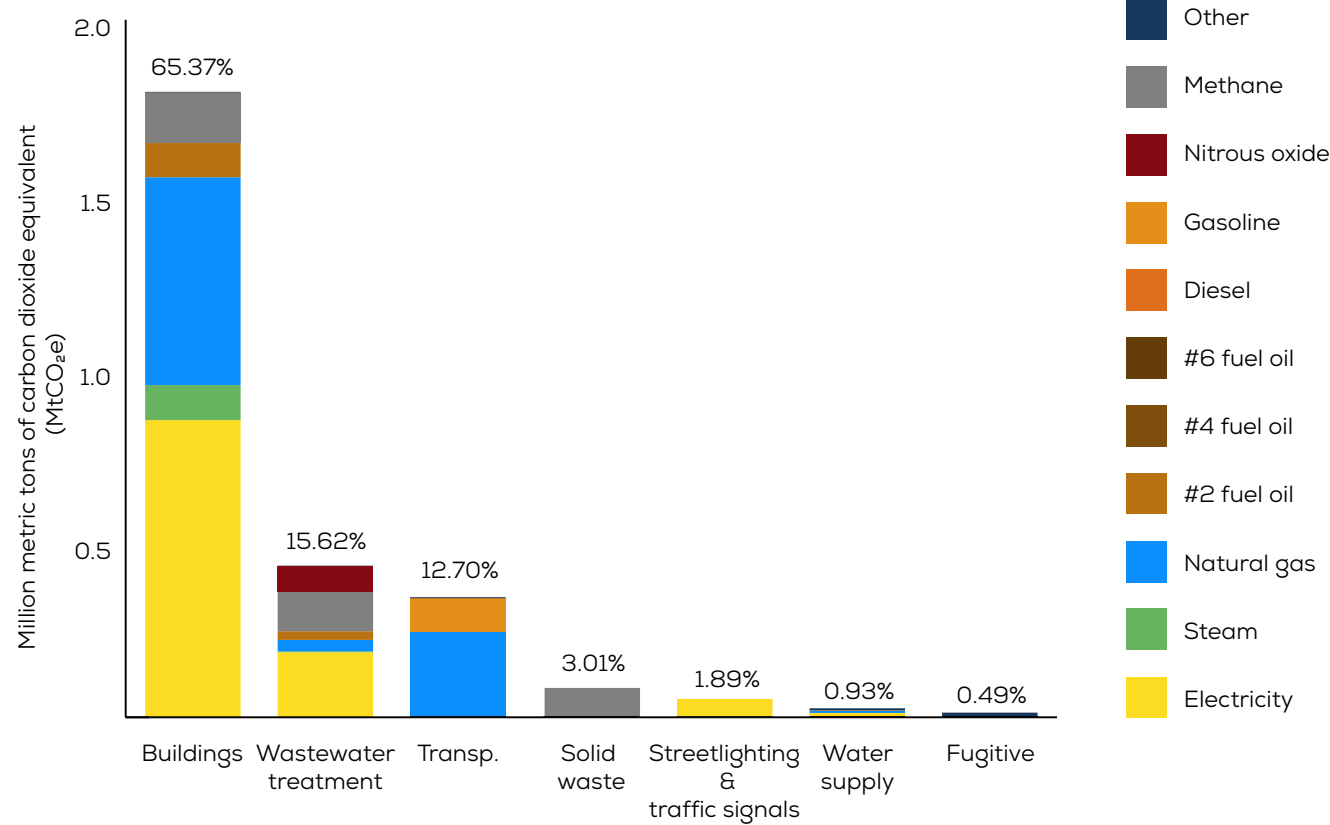


*GHG emissions from HFCs, propane, aviation jet fuel, #1 fuel oil, kerosene, ethanol, and biodiesel account for less than 1% of city government GHG emissions

CITY GOVERNMENT ANNUAL GHG EMISSIONS BY SECTOR



CITY GOVERNMENT ANNUAL GHG EMISSIONS BY SECTOR AND SOURCE



*GHG emissions from HFCs, propane, jet fuel, #6 fuel oil, kerosene, ethanol, and biodiesel account for less than 1% of city government GHG emissions

As is the case in the Citywide GHG Inventory, energy used in buildings is by far the largest source of emissions in City Government, generating 65% (1.8 MtCO_{2e}) of City Government emissions.

Wastewater treatment generated 16% (0.43 MtCO_{2e}) of City Government GHG emissions. wastewater treatment emissions were driven by electricity consumption (43%) and methane emissions (26%).

Transportation contributed 13% (0.35 MtCO_{2e}) of City Government GHG emissions. On-road diesel emissions were the main source of transportation-based emissions (45%), followed by Gasoline (28%), and Diesel for Marine Transport (26%).

20 YEAR GLOBAL WARMING POTENTIAL

Standard GHG accounting methods track six key GHGs (CO₂, CH₄, N₂O, PFCs, HFCs, SF₆). Each of these gases differs in their ability to absorb energy (“radiative efficiency”), and how long they live in the atmosphere (“lifetime”). The Global Warming Potential (GWP) of a GHG is a multiplier used to allow comparisons of the impacts of emissions of various GHGs on global warming by converting them to a common unit: carbon dioxide equivalent (CO_{2e}). The larger the GWP the more a particular GHG warms the earth over a given timeframe. The most commonly used timeframe is 100 years. For instance, methane (CH₄) is estimated to have a GWP of 25 over 100 years.

In addition to the 100 year timeframe, NYC has also calculated GHG emissions using 20-year GWPs. These GWPs do not consider impacts that happen more than 20 years after emissions occur and therefore prioritize gases with shorter lifetimes. In the case of methane (which has a short lifetime), 100 year GWP of methane is 25, but its 20-year GWP is much higher at 72. This view of GHG emissions can provide the City with more detail when assessing short term vs long term strategies.

Key observations from this analysis include:

- Emissions from buildings remain the largest driver of Citywide emissions in both the 20 and 100 year timeframes
- The 20 year timeframe view shows that emissions from waste sectors are larger drivers of short term emissions than in the 100 year timeframe.
 - » Citywide GHG emissions from the waste sector are over twice as large as a proportion of total emissions (9% of total on 20 year timeframe, 4% on 100 year timeframe).
 - » City Government GHG emissions from solid waste facilities are more than double as a proportion of total emissions. (8% of total on 20 year timeframe, 3% on 100 year timeframe).
 - » City government’s wastewater treatment emissions are 25% larger (8% of total on 20 year timeframe, 3% on 100 year timeframe).
- Under a 20-year GWP framework, City government GHG emissions dropped by 29.8% relative to 2006 (compared to 24.7% under a 100-year GWP framework).

UNCERTAINTY

A GHG inventory is both an accounting and scientific exercise; uncertainty exists in data collection and aggregation, as well as in the calculation of GHG emissions. Uncertainty is inherently part of GHG calculations, as both the development of emission factors and global warming potentials involve scientific uncertainty. Uncertainty also is a part of the measurement, modeling, and estimation necessary to complete GHG inventories. While a precise margin of error has not been calculated for this GHG inventory, it is understood that all results have some uncertain elements and should be interpreted and used accordingly.

CITYWIDE SCOPES EMISSIONS

SECTOR	TOTAL GHG (MtCO _{2e})			
	Scope 1	Scope 2	Scope 3	Total
STATIONARY ENERGY	21.75	13.02	-	34.77
TRANSPORTATION	14.99	555.01	-	15.54
WASTE	0.18	-	1.62	1.89
TOTAL	36.91	13.57	1.62	51.92

Sector	Units	CY 2005			CY 2015		
		Consumed	tCO ₂ e	Source MMbtu	Consumed	tCO ₂ e	Source MMbtu
STATIONARY ENERGY							
RESIDENTIAL (SMALL AND LARGE RESIDENTIAL)							
#2 fuel oil	liter	555,115,513	1,509,205	20,485,363	642,371,709	1,746,430	23,705,369
#4 fuel oil	liters	294,735,132	858,782	11,486,968	371,262,975	1,081,765	14,469,554
#6 fuel oil	liters	733,787,288	2,202,564	29,446,928	48,457,191	145,451	1,944,590
Biofuel	liters	2,723,585	5	92,994	34,527,400	59	1,178,900
Electricity	kWh	14,168,364,734	6,079,321	133,021,044	15,701,860,145	4,035,680	148,976,038
Natural gas	GJ	180,307,273	9,088,939	179,443,212	184,436,188	9,297,070	183,552,340
Steam	kg	1,998,982,584	332,201	5,749,261	2,671,762,180	286,277	6,099,429
COMMERCIAL AND INSTITUTIONAL (COMMERCIAL, INSTITUTIONAL, AND STREETLIGHTS)							
#2 fuel oil	liters	314,564,916	855,215	11,608,353	364,010,009	989,642	13,433,019
#4 fuel oil	liters	52,603,950	153,274	2,050,179	66,262,542	193,072	2,582,507
#6 fuel oil	liters	90,043,029	270,277	3,613,432	5,946,181	17,848	238,621
Biofuel	liters	685,603	1	23,409	8,691,520	15	296,762
Electricity	kWh	26,226,076,079	11,253,009	246,226,018	24,916,358,669	6,403,983	236,401,315
Natural gas	GJ	60,301,084	3,039,660	60,012,112	110,953,139	5,592,932	110,421,433
Steam	kg	7,457,786,326	1,239,372	21,449,291	5,318,470,947	569,870	12,141,662
MANUFACTURING AND CONSTRUCTION (INDUSTRIAL)							
#2 fuel oil	liters	72,520,283	196,673	2,676,208	83,919,431	227,587	3,096,869
#4 fuel oil	liters	11,333,710	32,943	441,718	14,276,502	41,496	556,410
#6 fuel oil	liters	6,952,951	20,819	279,022	459,153	1,375	18,426
Biofuel	liters	121,709	0	4,156	1,542,930	3	52,682
Electricity	kWh	8,779,889,926	3,767,250	82,430,834	9,030,045,419	2,320,895	85,675,224
Natural gas	GJ	18,090,325	910,089	18,003,634	26,789,018	1,347,703	26,660,640
Steam	kg	2,237,335,898	371,812	6,434,787	1,595,541,286	170,961	3,642,499
FUGITIVE NATURAL GAS							
CH ₄ - natural gas distribution	GJ	442,833	207,588	-	551,495	258,527	-
TRANSPORTATION							
ON-ROAD							
Passenger cars	VMT	19,318,051,038	12,881,945	192,791,648	20,031,919,734	12,379,304	188,814,821
Medium duty trucks	VMT	487,628,577	387,786	5,670,969	505,647,835	401,210	5,898,073
Heavy duty trucks	VMT	632,294,047	1,419,991	19,772,771	655,658,982	1,466,398	20,408,545
Buses	VMT	346,001,787	687,896	9,548,307	294,114,348	586,859	8,633,174
RAILWAYS							
Electricity - subway and commuter rail	kWh	2,223,041,708	953,856	20,871,239	2,163,557,443	556,076	20,527,391
Diesel - commuter rail	liters	5,207,218	14,098	192,691	5,452,200	14,761	201,756
MARINE NAVIGATION							
Diesel - marine navigation	liters	18,247,504	49,962	673,386	25,241,030	69,110	931,467
Biofuel	liters	-	-	-	45,333	0.1	1,548
Gasoline - marine navigation	liters	-	-	-	8,718	21	291
AVIATION							
Jet fuel - aviation	liters	933,093	2,426	33,610	1,016,754	2,643	36,623
WASTE							
LANDFILLS							
Exported solid waste - landfills	MT	7,420,036	2,021,979	-	5,538,963	1,509,381	-
BIOLOGICAL TREATMENT							
CH ₄ and N ₂ O - composting	MT	26,351	4,991	-	564,146	106,849	-
WASTEWATER TREATMENT							
CH ₄ - wastewater treatment plants	MT	6,536	163,402	-	5,841	146,037	-
N ₂ O - wastewater treatment plants	MT	286	85,120	-	251	74,873	-
TOTALS			61,062,452	1,084,533,543		52,042,167	1,120,597,977

CY 2016			Change from 2015			Change from 2005		
Consumed	tCO ₂ e	Source MMbtu	Consumed	tCO ₂ e	Source MMbtu	Consumed	tCO ₂ e	Source MMbtu
703,282,967	1,912,031	25,953,170	9%	9%	9%	27%	27%	27%
375,809,72	1,095,013	14,646,758	1%	1%	1%	28%	28%	28%
7,198,342	21,607	288,870	-85%	-85%	-85%	-99%	-99%	-99%
55,591,534	95	1,898,111	61%	61%	61%	1941%	1941%	1941%
15,683,116,931	4,088,662	148,798,206	0%	1%	0%	11%	-33%	12%
183,908,884	9,270,489	183,027,563	0%	0%	0%	2%	2%	2%
2,733,212,561	318,340	6,239,715	2%	11%	2%	37%	-4%	9%
398,526,329	1,083,482	14,706,771	9%	9%	9%	27%	27%	27%
67,074,040	195,437	2,614,135	1%	1%	1%	28%	28%	28%
883,308	2,651	35,447	-85%	-85%	-85%	-99%	-99%	-99%
13,993,956	24	477,808	61%	61%	61%	1941%	1941%	1941%
25,108,459,713	6,545,893	238,223,930	1%	2%	1%	-4%	-42%	-3%
104,170,759	5,251,046	103,671,556	-6%	-6%	-6%	73%	73%	73%
4,861,229,054	566,192	11,097,814	-9%	-1%	-9%	-35%	-54%	-48%
91,876,877	249,168	3,390,522	9%	9%	9%	27%	27%	27%
14,451,343	42,005	563,225	1%	1%	1%	28%	28%	28%
68,207	204	2,737	-85%	-85%	-85%	-99%	-99%	-99%
2,484,226	4	84,821	61%	61%	61%	1941%	1941%	1941%
9,146,721,603	2,384,593	86,782,224	1%	3%	1%	4%	-37%	5%
26,155,341	1,315,824	26,030,000	-2%	-2%	-2%	45%	45%	45%
1,458,368,718	169,858	3,329,344	-9%	-1%	-9%	-35%	-54%	-48%
541,314	253,754	-	-2%	-2%	0%	22%	22%	0%
20,094,018,685	12,417,680	188,179,571	0%	0%	0%	4%	-4%	-2%
507,215,343	402,454	5,914,422	0%	0%	0%	4%	4%	4%
657,691,524	1,470,944	20,461,236	0%	0%	0%	4%	4%	3%
305,464,091	586,830	8,714,849	4%	0%	1%	-12%	-15%	-9%
2,128,891,161	555,012	20,198,484	-2%	0%	-2%	-4%	-42%	-3%
5,028,922	13,615	186,093	-8%	-8%	-8%	-3%	-3%	-3%
33,364,727	91,353	1,231,255	32%	32%	32%	83%	83%	83%
50,226	0.1	1,715	11%	11%	11%			
-	-	-	-100%	-100%	-100%			
974,354	2,533	35,096	-4%	-4%	-4%	4%	4%	4%
5,523,363	1,505,130	-	0%	0%	0%	-26%	-26%	0%
619,722	117,375	-	0%	0%	0%	0%	0%	0%
4,157	103,924	-	-29%	-29%	0%	-36%	-36%	0%
240	71,552	-	-4%	-4%	0%	-16%	-16%	0%
	52,104,773	1,116,785,448		0%	0%		-15%	3%

Sector	Units	FY 2006			FY 2015		
		Consumed	tCO ₂ e	Source Mmbtu	Consumed	tCO ₂ e	Source Mmbtu
BUILDINGS							
#2 fuel oil	liter	56,816,067	154,467	2,096,677	78,897,011	214,499	2,911,527
#4 fuel oil	liter	32,426,496	94,482	1,263,786	69,193,895	201,613	2,696,754
#6 fuel oil	liter	75,041,558	225,248	3,011,422	9,042,569	27,143	362,879
Biodiesel	liter	-	-	-	8,391,778	102	286,528
Electricity	kWh	3,199,648,988	1,209,240	29,041,147	3,295,468,753	846,999	31,266,734
Kerosene	liter	-	-	-	93,092	250	3,445
Natural gas	GJ	11,068,300	557,932	11,015,259	12,523,395	631,280	12,463,381
Propane	liter	4,086,926	6,095	99,310	119,359	178	2,900
Steam	kg	781,066,529	104,024	1,904,376	985,295,718	105,574	2,168,698
TRANSPORTATION							
Gasoline	liter	51,838,820	122,621	1,728,914	41,594,920	98,390	1,387,262
Ethanol	liter	5,972,192	-	134,695	4,622,552	535	104,256
Diesel - trucks	liter	60,061,625	161,136	2,222,552	60,530,889	162,396	2,239,917
Biodiesel - trucks	liter	-	-	-	6,595,968	8	225,212
Diesel - marine vessels	liter	18,247,504	49,962	673,386	25,107,072	68,744	926,523
Jet fuel	liter	933,093	2,426	33,610	942,008	2,449	33,931
STREETLIGHTS AND TRAFFIC SIGNALS							
Electricity	kWh	306,246,001	115,739	2,779,597	201,195,422	51,711	1,908,901
WASTEWATER TREATMENT							
#1 fuel oil	liter	-	-	-	5,364	14	198
#2 fuel oil	liter	18,314,093	49,667	675,843	12,776,429	34,649	471,487
#4 fuel oil	liter	1,129,823	3,284	44,034	-	-	-
Electricity	kWh	596,089,952	225,280	5,410,323	692,309,021	177,937	6,568,486
Natural gas	liter	380,655	19,150	378,831	622,039	31,294	619,058
Steam	kg	106,123,696	14,134	258,748	37,549,979	4,023	82,650
Methane	Mg CH ₄	7,068	176,698	-	5,597	139,913	-
Nitrous oxide	Mg N ₂ O	268	79,916	-	253	75,523	-
WATER SUPPLY							
#2 fuel oil	liter	234,386	637	8,650	1,000,355	2,720	36,916
Biodiesel	liter	-	-	-	45,854	0	1,566
Electricity	kWh	23,253,033	8,788	211,053	77,505,486	19,920	735,356
Natural gas	GJ	2,921	147	2,907	97,449	4,902	96,982
Propane	liter	-	-	-	4,919,859	7,337	119,550
SOLID WASTE FACILITIES							
Methane	Mg CH ₄	9,969	249,217	-	2,975	74,386	-
FUGITIVE AND PROCESS EMISSIONS							
HFCs - municipal vehicle fleet	kg	8,722	12,513	-	8,377	12,019	-
TOTALS			3,642,804	62,995,119		2,996,507	67,721,097

FY 2016			Change from 2015			Change from 2006		
Consumed	tCO ₂ e	Source Mmbtu	Consumed	tCO ₂ e	Source Mmbtu	Consumed	tCO ₂ e	Source Mmbtu
45,134,897	122,709	1,665,608	-43%	-43%	-43%	-21%	-21%	-21%
48,817,617	142,242	1,902,611	-29%	-29%	-29%	51%	51%	51%
161,657	485	6,487	-98%	-98%	-98%	-100%	-100%	-100%
4,476,246	55	152,836	-47%	-47%	-47%	-	-	-
3,226,157,023	841,074	30,609,118	-2%	-1%	-2%	1%	-30%	5%
-	-	-	-100%	-100%	-100%	-	-	-
11,665,695	588,045	11,609,791	-7%	-7%	-7%	5%	5%	5%
81,617	122	1,983	-32%	-32%	-32%	-98%	-98%	-98%
852,003,172	99,234	1,875,313	-14%	-6%	-14%	9%	-5%	-2%
TRANSPORTATION								
41,337,886	97,782	1,378,690	-1%	-1%	-1%	-20%	-20%	-20%
4,595,587	532	103,648	-1%	-1%	-1%	-23%	-	-23%
58,202,933	156,150	2,153,772	-4%	-4%	-4%	-3%	-3%	-3%
7,205,312	9	246,017	9%	9%	9%	-	-	-
33,352,496	91,320	1,230,803	33%	33%	33%	83%	83%	83%
1,036,695	2,695	37,342	10%	10%	10%	11%	11%	11%
STREETLIGHTS AND TRAFFIC SIGNALS								
198,573,670	51,769	1,884,026	-1%	0%	-1%	-35%	-55%	-32%
WASTEWATER TREATMENT								
780	2	29	-85%	-85%	-85%	-	-	-
8,880,845	24,085	327,729	-30%	-30%	-30%	-52%	-52%	-52%
-	-	-	-	-	-	-100%	-100%	-100%
704,714,618	183,722	6,686,188	2%	3%	2%	18%	-18%	24%
636,928	32,043	633,875	2%	2%	2%	67%	67%	67%
27,779,558	3,236	61,145	-26%	-20%	-26%	-74%	-77%	-76%
4,540	113,504	-	0%	-19%	0%	0%	-36%	0%
242	72,011	-	0%	-5%	0%	0%	-10%	0%
WATER SUPPLY								
714,742	1,943	26,376	-29%	-29%	-29%	205%	205%	205%
28,528	0	974	-38%	-38%	-38%	-	-	-
48,390,034	12,616	459,115	-38%	-37%	-38%	108%	44%	118%
96,095	4,834	95,635	-1%	-1%	-1%	3190%	3190%	3190%
4,064,234	6,061	98,759	-17%	-17%	-17%	-	-	-
SOLID WASTE FACILITIES								
3,302	82,555	-	0%	11%	0%	0%	-67%	0%
FUGITIVE AND PROCESS EMISSIONS								
9,157	13,393	-	0%	11%	0%	0%	7%	0%
	2,744,226	63,247,871		-8%	-7%		-25%	0%

FUEL EMISSION FACTORS

	Unit	GREENHOUSE GAS (kg/unit)				
		CO ₂ (fossil)	CO ₂ (biogenic)	CH ₄	N ₂ O	CO ₂ e
Stationary source						
Natural gas (buildings)	GJ	50.2559		0.0050	0.000100	50.411
Natural gas (industrial)	GJ	50.2559		0.0010	0.000100	50.311
#2 fuel oil (buildings)	liter	2.7020		0.0004	0.000022	2.719
#2 fuel oil (industrial)	liter	2.7020		0.0001	0.000022	2.711
#4 fuel oil (buildings)	liter	2.8961		0.0004	0.000023	2.914
#4 fuel oil (industrial)	liter	2.8961		0.0001	0.000023	2.906
#6 fuel oil (buildings)	liter	2.9834		0.0004	0.000024	3.001
#6 fuel oil (industrial)	liter	2.9834		0.0001	0.000024	2.994
Biodiesel (biogenic carbon)	liter		2.0094	0.0000	0.000004	0.002
Propane	liter	1.4846		0.0001	0.000015	1.491
Kerosene	liter	2.6812		0.0001	0.000022	2.690
On-road mobile source						
Gasoline - passenger cars	liter	2.3421		0.0002	0.000265	2.425
Gasoline - light trucks	liter	2.3421		0.0002	0.000300	2.425
Diesel passenger cars	liter	2.6799		0.0000	0.000004	2.681
Diesel - light trucks	liter	2.6799		0.0000	0.000004	2.681
Diesel - heavy duty vehicles	liter	2.6799		0.0000	0.000011	2.683
Diesel - bus	liter	2.6799		0.0000	0.000016	2.685
Biodiesel - heavy duty trucks	liter		2.0094	0.0000	0.000004	0.002
Ethanol (E100) - passenger car	liter		1.5285	0.0003	0.000414	1.660
CNG - buses	GJ	50.247		0.0659	0.005866	53.642
Off-road						
Jet Fuel	liter	2.4660		0.0000	0.000079	2.490
Aviation gasoline	liter	2.1955		0.0019	0.000029	2.251
Diesel - rail locomotive	liter	2.6799		0.0002	0.000069	2.706
Diesel - marine (in port)	liter	2.6799		0.0000	0.000119	2.716

ELECTRICITY EMISSION FACTORS

Year	kgCO ₂ /MWh	kgCH ₄ /MWh	kgN ₂ O/MWh	kgCO ₂ e/MWh
2005	428.1620	0.0086	0.0023	429.0771
2006	377.0922	0.0065	0.0023	377.9291
2007	378.8847	0.0068	0.0023	379.7286
2008	333.8455	0.0058	0.0019	334.5704
2009	301.1264	0.0054	0.0015	301.7056
2010	263.5869	0.0048	0.0013	264.0865
2011	279.2523	0.0052	0.0010	279.6817
2012	268.0371	0.0052	0.0008	268.3923
2013	269.2007	0.0051	0.0007	269.5332
2014	264.4634	0.0050	0.0006	264.7683
2015	256.6938	0.0051	0.0007	257.0192
2016	260.3783	0.0053	0.0007	260.7047

STEAM EMISSION FACTORS

Year	MMBTU/metric ton of steam	Steam emissions factors- kg per metric ton delivered to buildings			
		CO ₂	CH ₄	N ₂ O	CO ₂ e
2005	2.8761	165.7703	0.0053	0.0009	166.1850
2006	2.4382	132.8644	0.0041	0.0007	133.1826
2007	2.5226	137.8423	0.0043	0.0008	138.1739
2008	2.4609	132.0984	0.0039	0.0007	132.3949
2009	2.6251	142.5200	0.0043	0.0007	142.8481
2010	2.3331	122.4715	0.0035	0.0006	122.7282
2011	2.4225	122.6074	0.0032	0.0005	122.8326
2012	2.1083	102.7037	0.0025	0.0004	102.8749
2013	2.1638	104.8528	0.0025	0.0003	105.0162
2014	2.3022	110.6113	0.0024	0.0003	110.7578
2015	2.2011	107.0042	0.0023	0.0003	107.1492
2016	2.1625	116.3374	0.0023	0.0003	116.4710

HEATING AND COOLING DEGREE DAYS

	YEAR	ANNUAL TOTAL	% CHANGE FROM PREVIOUS YEAR	% CHANGE FROM BASE YEAR
Calendar years				
Heating degree days	2004	4,787	-	-
Heating degree days	2005	4,733	-1.10%	-
Heating degree days	2006	3,987	-15.80%	-15.80%
Heating degree days	2007	4,705	18.00%	-0.60%
Heating degree days	2008	4,598	-2.30%	-2.90%
Heating degree days	2009	4,760	3.50%	0.60%
Heating degree days	2010	4,447	-6.60%	-6.00%
Heating degree days	2011	4,335	-2.50%	-8.40%
Heating degree days	2012	3,978	-8.20%	-16.00%
Heating degree days	2013	4,670	17.40%	-1.30%
Heating degree days	2014	4,875	4.40%	3.00%
Heating degree days	2015	4,460	-8.50%	-5.80%
Heating degree days	2016	4,252	-4.70%	-10.20%
Cooling degree days	2004	1,053	-	-
Cooling degree days	2005	1,472	39.80%	-
Cooling degree days	2006	1,130	-23.20%	-23.20%
Cooling degree days	2007	1,212	7.30%	-17.70%
Cooling degree days	2008	1,163	-4.00%	-21.00%
Cooling degree days	2009	876	-24.70%	-40.50%
Cooling degree days	2010	1,549	76.80%	5.20%
Cooling degree days	2011	1,331	-14.10%	-9.60%
Cooling degree days	2012	1,277	-4.10%	-13.20%
Cooling degree days	2013	1,272	-0.40%	-13.60%
Cooling degree days	2014	1,128	-11.30%	-23.40%
Cooling degree days	2015	1,581	40.20%	7.40%
Cooling degree days	2016	1,489	-5.80%	1.20%
Fiscal years				
Heating degree days	2005	4,713	-	-
Heating degree days	2006	4,261	-9.60%	-
Heating degree days	2007	4,460	4.70%	4.70%
Heating degree days	2008	4,470	0.20%	4.90%
Heating degree days	2009	4,835	8.20%	13.50%
Heating degree days	2010	4,377	-9.50%	2.70%
Heating degree days	2011	4,726	8.00%	10.90%
Heating degree days	2012	3,715	-21.40%	-12.80%
Heating degree days	2013	4,637	24.80%	8.80%
Heating degree days	2014	4,962	7.00%	16.50%
Heating degree days	2015	4,974	0.20%	16.70%
Heating degree days	2016	3,768	-24.20%	-11.60%
Cooling degree days	2005	1,066	-	-
Cooling degree days	2006	1,435	34.60%	-
Cooling degree days	2007	1,177	-18.00%	-18.00%
Cooling degree days	2008	1,202	2.10%	-16.20%
Cooling degree days	2009	1,051	-12.60%	-26.80%
Cooling degree days	2010	1,112	5.80%	-22.50%
Cooling degree days	2011	1,442	29.70%	0.50%
Cooling degree days	2012	1,317	-8.70%	-8.20%
Cooling degree days	2013	1,285	-2.40%	-10.50%
Cooling degree days	2014	1,234	-4.00%	-14.00%
Cooling degree days	2015	1,229	-0.40%	-14.40%
Cooling degree days	2016	1,545	25.70%	7.70%

Appendix IV – Methodology

80 x 50 METHODOLOGY

This plan drew on the extensive analysis and stakeholder engagement conducted to produce the *Roadmap to 80 x 50*. For more on the 80 x 50 methodology, see nyc.gov/80x50

To develop this plan, and identify opportunities to accelerate GHG reductions, climate actions with the greatest potential for GHG emissions reduction were identified from the *Roadmap to 80 x 50* and through additional discussions with City agencies and stakeholders.

Each of the actions was further evaluated in order to develop a list of priority commitments for the City to take by 2020. This prioritization was based first on GHG mitigation. The second round of prioritization focused on the risk reduction achieved through adaptation and resiliency, as well as additional benefit potential — e.g. job creation, equity, and health improvements. While NYC’s mitigation work aims to reduce the effects of climate change by reducing GHG emissions, our adaptation and resiliency work prepares NYC for the climate-related impacts we are likely to face. Additional prioritization considerations included necessary investment and feasibility.

THE 2020 CLIMATE ACTIONS DASHBOARD




The dashboard provides information about action implementation and impacts, including the responsible City agency to lead implementation, GHG reduction potential, anticipated level of investment, and additional benefit potential.

GHG ASSESSMENT

Climate actions were identified through the strategies presented in the *Roadmap to 80 x 50* and through additional discussions with city agencies and stakeholders. Actions were considered based on the near- and long-term GHG reduction potential, as well as the ability to enable or accelerate implementation of actions with high GHG reduction potential, and the ability to accelerate or multiply the GHG reductions of other actions. The potential GHG reduction for each action was evaluated independently, based on the information collected and analyzed during the *Roadmap to 80 x 50* analysis process.

The GHG prioritization methodology is based on the total GHG emissions reduction potential (metric tons of CO₂e) of each of the actions. Actions that cannot be quantified by GHG emission reduction potential were prioritized where the action is essential for or enables major GHG emission reducing actions and where the action accelerates or has a multiplying effect on other major actions.

The resulting GHG emission savings for each major actions are estimated in year 2030:

-  Major Reduction Potential
Greater than 400,000 tCO₂e by 2030
-  Moderate Reduction Potential
Up to 400,000 tCO₂e by 2030
-  Enabling, Accelerating or Multiplying Effect

BENEFIT ASSESSMENT

The potential benefits of actions were evaluated using the four guiding OneNYC visions — growth, equity, sustainability, and resiliency. The evaluation of the actions’ potential benefits was conducted using a qualitative approach based on expert knowledge, as well as the assessment of findings gathered from a literature review across a number of high-quality sources, namely, academic papers from peer-reviewed journals and industry reports.

Framing questions were further developed through stakeholder outreach and agency representation during the development of the *Roadmap to 80 x 50* to better assess benefit potential, especially where there was not consensus in scientific literature on the impact of an action for a specific benefit, the quality of the impact could not be determined without taking into account other external conditions, or the success of the action heavily depended on local- and context-specific factors.

Benefit potential was categorized as neutral, moderate, or major based on answers to the framing questions. A “major” benefit potential was assessed if there were multiple potential positive impacts within a given benefit category (for example, improved air quality and improved access to green spaces within the Health & Wellbeing benefit), the benefit was significant enough to serve as a stand-alone rationale for action, or there was strong justification in the literature review or by experts within each agency to suggest a major benefit. A “neutral” benefit potential was assigned where there was no assessed correlation between a given action and potential benefit. A “moderate” designation captured any actions falling in between “major” and “neutral”.

ONENYC VISION: GROWTH

QUALITY JOBS

1. Could this generate new, quality jobs?
2. Could this lead to sustained, long-term job impacts?
3. Could this increase the median household income?
4. Could this increase access to quality jobs?

ECONOMY AND INNOVATION

1. Could this unlock private sector capital, technology adoption, and/or innovation?
2. Could this support growth in innovation industries, including green infrastructure; advanced manufacturing; advertising, media, and arts; biotechnology and life sciences; design; e-commerce; and technology and information?
3. Could this increase the share of private sector jobs in innovation industries?
4. Could this have a positive economic impact on local businesses and for residents?

WORKFORCE DEVELOPMENT

1. Could this improve workers’ skills?
2. Could this increase the number of NYC public school graduates attaining professional certifications, or technical, associates or bachelor’s degrees?
3. Could this increase the number of individuals receiving City-sponsored, industry-focused training?
4. Could this increase workforce participation?

LONG-TERM COST SAVINGS

1. Could this benefit health outcomes and productivity, leading to reduced citywide healthcare costs?
2. Could this mitigate the risk of property damage to city infrastructure?
3. Could this lead to long-term energy savings?
4. Could this improve economic output/productivity by decreasing transit times?
5. Could this improve economic output/productivity by improving health and wellbeing?

ONENYC VISION: EQUITY

HEALTH AND WELLBEING

1. Could this improve outdoor air quality and reduce incidences of asthma, respiratory, and cardiac problems?
2. Could this improve indoor air quality, ventilation, or temperature control?
3. Could this increase the comfort and mental health of residents?

4. Could this lead to improvements in the quality of indoor spaces (e.g. reduction of toxins, integrated pest management, mold)?
5. Could this reduce noise pollution?
6. Could this reduce light pollution?
7. Could this increase access to quality food?
8. Could this encourage active, healthy modes of travel? Would this shift lead to a significant increase in physical activity?
9. Could this bolster quality of life by saving time?
10. Could this improve access to green and healthy spaces or to community members?
11. Could this address health or environmental justice disparities?

SAFETY

1. Could this improve fire safety?
2. Could this improve safety during commutes and align with the goal of ending traffic deaths and injuries?
3. Could this increase access to essential services such as hospitals?
4. Could this mitigate rising temperatures in the city and not contribute to the urban heat island effect?
5. Could this increase public safety?

AFFORDABILITY

1. Could this reduce the energy cost burden for renters who pay a disproportionate amount of their monthly pre-tax income on energy?
2. Could this improve affordability for severely rent-burdened households?
3. Could this limit displacement of residents and small businesses when surrounding property values rise?
4. Could this increase energy price stability?
5. Could this address disparities in affordability?

ACCESS

1. Could this expand access to walking and biking paths, public transportation, clean energy, affordable housing, health, services, quality jobs, and other benefits?
2. Could this address historical disparities?
3. Could this increase nearby amenities and improve the walkability of the area?
4. Could this address environmental health disparities or promote environmental justice?

COMMUNITY

1. Could this increase community participation?
2. Could this build stronger communities?

ONENYC VISION: SUSTAINABILITY

LEAD BY EXAMPLE

1. Does this ensure the city is leading by example?
2. Could this influence actions led by another city, state, or federal entity?
3. Could this increase public awareness of climate change issues?
4. Could this lead to replicable legislation in other cities?

ONENYC VISION: RESILIENCY

RESILIENCY

1. Could this mitigate climate change risks and improve the city's adaptive capacity?
2. Could this strengthen social cohesion in communities and emergency preparedness and response networks?
3. Could this mitigate rising temperatures in city and mitigate the urban heat island effect?
4. Could this reduce heat risks for vulnerable populations?
5. Could this increase the percentage of residents with back-up generation?
6. Could this improve more rapid evacuation or emergency response?

RELIABILITY

1. Could this increase fuel diversity?
2. Could this reduce peak electricity demand?
3. Could this bolster energy reliability that is essential to keeping people safe during emergency events?
4. Could this increase the number of residents with backup generation?
5. Could this minimize disruptions to energy or mobility services during emergencies or natural disasters?

NATURAL CAPITAL

1. Could this increase ecosystem services by preserving and restoring land, protecting waterways, or preventing sewage discharges?
2. Could this contribute to preservation of greenfields, prime wildlife habitat, or wetlands?

3. Could this increase the amount of permeable surface cover?
4. Could this mitigate rising temperatures in city and not contribute to the urban heat island effect?

INTEGRATING ADAPTATION AND RESILIENCY

With the current projections for global warming, NYC faces urgent risks related to climate change including, but not limited to, increasing average temperatures, humidity, and precipitation; sea level rise, flooding; and an increasing frequency of more intense storms. In addition to the potential to reduce GHG emissions, the actions detailed in this report were assessed according to their potential to improve the city's resiliency to climate change impacts. This assessment was completed through a qualitative review during which experts identified and prioritized actions based on their potential to increase resilience, reliability, and natural capital. For example, by installing more renewable energy and storage options, the City will increase grid diversification, leading to increased flexibility during grid operations and emergency response. The over \$20 billion the City is investing through its citywide resiliency program presents an opportunity to foster new sectors, create jobs, and train the workforce for a 21st century economy. Deep energy retrofits of the city's built infrastructure will also offer opportunities to integrate resilient features.

While the City works to reduce its own contributions of GHG emissions through its 80 x 50 commitment, the Mayor's Office is working across City government to adapt the city to the inevitable effects of climate change. The Office of Sustainability works hand-in-hand with the Office of Recovery and Resiliency to coordinate efforts on climate change mitigation and adaptation. In 2013, the City released its comprehensive climate resilience plan *A Stronger, More Resilient New York* that outlined a 10-year program with 257 initiatives for adapting the city's buildings, infrastructure systems, waterfronts, and its hardest-hit neighborhoods after Hurricane Sandy. With the release of *One New York: The Plan for a Strong and Just City (OneNYC)* in 2015, the City integrated its visions

for sustainability and resiliency with its visions for growth and equity under its 10-year strategic plan. Through *OneNYC*, the City continues to deliver on these resiliency initiatives in order to ensure that our neighborhoods, economy, and public services will be ready to withstand and emerge stronger from the impacts of climate change and other 21st century threats.

Major resiliency accomplishments to-date include: (1) working with the New York City Panel on Climate Change (NPCC) in 2015 to produce projections for climate change through 2100; (2) securing an agreement with the Federal Emergency Management Agency to revise the city's flood maps to reflect both current and future climate risks, saving residents tens of millions of dollars in flood insurance premiums; (3) providing \$1.77 million in micro-grants and risks assessments for small business resiliency retrofits; (4) launching Cool Neighborhoods NYC to address the mitigation of and adaptation to the urban heat island effect in targeted, heat-vulnerable neighborhoods; and (5) releasing preliminary climate resiliency design guidelines to institutionalize resiliency across the City's capital program. More information on the City's ongoing and completed resiliency projects can be found at nyc.gov/onenyc.

NECESSARY INVESTMENT AND FEASIBILITY ASSESSMENT

Investments necessary for each of the actions were identified by evaluating operating and capital investments required by City agencies, State agencies, and the private sector through 2030. The magnitude and the timeline for these investments were estimated based on information provided by relevant agencies, stakeholders, and research.

For each action, necessary investments were estimated across City Capital, Expense, Personnel, and Non-City investments. Non-City investments included high-level assessments across the private sector, NY State, federal government, and utility ratepayers. The City's agencies and outside experts were consulted and supported by a literature review process in order to accurately estimate investments necessary for each action. Necessary

investments are characterized by four tranches — under \$10 million, \$10 to \$100 million, \$100 million to \$1 billion, and over \$1 billion. Estimates were calculated to include investments necessary through 2030, where possible. Non-city investments were not estimated for advocacy oriented actions.

The feasibility of actions was assessed based on the action’s stage in its life cycle, e.g. existing actions, actions slated for expansion, and new actions; the City’s ability to directly implement (City-led or non-City-led); and ease of funding, e.g. whether an action may be adopted quickly with precedents for funding at scale, or faces funding or financing barriers, such as long time horizons for return on investment.

LEAD NYC AGENCIES

CUNY	The City University of New York
DCAS	Department of Citywide Administrative Services
DCP	Department of City Planning
DEP	Department of Environmental Protection
DOB	Department of Buildings
DOT	Department of Transportation
DSNY	Department of Sanitation, New York
EDC	Economic Development Corporation
MOS	Mayor’s Office of Sustainability
NYCHA	New York City Housing Authority
ORR	Mayor’s Office of Recovery and Resiliency
SBS	Small Business Services

ACRONYMS

80 x 50	80 percent reduction in GHG by 2050 from 2005 levels
BAU	Business as usual
CO ₂ e	Carbon dioxide equivalent
DER	Distributed energy resource
EV	Electric vehicle
GHG	Greenhouse gas
HVI	Heat Vulnerability Index
IAQ	Indoor air quality
KSI	Killed or severely injured
MtCO ₂ e	Million metric tons of carbon dioxide equivalent
MW	Megawatts
NYISO	New York Independent System Operator
PACE	Property Assessed Clean Energy
PM2.5	Particulate matter smaller than 2.5 microns in diameter
PV	Photovoltaic
tCO ₂ e	Metric tons of carbon dioxide equivalent
VMT	Vehicle miles traveled

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PHOTO CREDITS

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ENDNOTES

- Parties to the United Nations Framework Convention on Climate Change
- New York City Community Districts were ranked by: (1) the total number of cyclists killed and severely injured (KSI; 2010 - 2014) and also ranked by (2) the percentage of streets with a protected or conventional bicycle lane (as of end of 2016). The two ranking systems were overlaid to identify the Priority Bicycle Districts, those that are high in cyclist KSI and low or medium in bicycle network coverage

