THE CITY OF PHILADELPHIA
OFFICE OF
SUSTAINABILITY

PHILADELPHIA CLIMATE ACTION PLAYBOOK

JANUARY 2021

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Letter from the Mayor

Greetings Friends,

Climate change is one of the most pressing issues of our time. Every day we see new evidence that climate change is real and that it is hurting our residents—particularly people of color and poor and working-class residents. If left unaddressed, the hotter and wetter climate will multiply existing risks like poverty, poor health, and economic inequity. But Philadelphia has never backed away from a challenge. We know that taking transformative action to address climate change now will ensure that Philadelphians can thrive today and for generations to come.

When the Trump Administration decided to withdraw from the Paris Climate Agreement, we committed Philadelphia to staying the course. We committed to reducing our carbon pollution and moving towards 100 percent renewable energy. This year, I committed us to going even farther to achieve carbon neutrality by 2050—a goal we know we must meet to prevent the worst impacts of climate change.

The City has made great progress in reducing emissions within City government and beyond. We're increasing energy efficiency in buildings to save money and create jobs through initiatives like Commercial Property Assessed Clean Energy and the Building Energy Performance Policy. This policy is projected to create 500 jobs while cutting carbon emissions by 200,000 metric tons, the equivalent of taking 40,000 cars off the road. We're ramping up the use of clean energy in homes and businesses through Solarize Philly. At the City, we'll purchase 22 percent of our municipal electricity from a new 70-megawatt solar facility built right here in Pennsylvania. We continue to promote low- and no-carbon transportation options by installing and protecting high quality bike lanes, expanding our equitable Indego bike share program and re-envisioning our transit system. And we're addressing the harms created by generating waste by exploring new opportunities, such as an urban mining pilot and a Community Composting Network.

We know that even while we continue to reduce Philadelphia's carbon pollution, we must deepen efforts to protect our residents, communities and infrastructure from a hotter, wetter future. We know that not all residents benefit from a healthy, climate resilient environment. That's why, with City Council's leadership, we're launching the City's first Environmental Justice Advisory Commission. Working to "Beat the Heat" in Hunting Park, we're lifting up community-led ideas to help neighborhoods cool off. Our innovative Green City, Clean Waters program is using green infrastructure to manage stormwater runoff and localized flooding. But seeing the Eastwick community devastated by flooding yet again shows that we have much more work to do in protecting our city from natural disasters.

For these reasons, I'm proud to share with you Philadelphia's Climate Action Playbook, a comprehensive overview of all the projects, policies, and plans our City has put forward to achieve climate justice. The information here is not new, but by bringing these efforts together we aim to clearly show what our commitments are, which agencies are leading them, what the time frames are for completion, what the co-benefits are, and where there is room for improvement. We hope this playbook will be used by those who want to learn more about what the City is doing and how we are working to create a thriving, resilient and just Philadelphia today and in the future.

Sincerely,

Jim Kenney
MAYOR

Christine Knapp
DIRECTOR

Introduction

In 2015, the world's nations came together in Paris to acknowledge the reality of climate change. People were already feeling the impact: hotter summers, increased precipitation, and stronger storms. 196 countries committed to reducing greenhouse gas (GHG) emissions to limit these impacts. These commitments are known as the Paris Climate Agreement (Paris Agreement).

The City of Philadelphia (the City) is committed to meeting the goals of the Paris Agreement. This document outlines actions the City is taking to meet these goals. It also outlines actions the City is taking to respond to the impacts that already have and will occur. Continuing to emit carbon as usual will have devastating impacts on our planet and our city. It will take commitment and collaboration from many stakeholders to meet our climate goals. But, together, we can work to build a more climate resilient Philadelphia.

What the Playbook IS:

The Philadelphia Climate Action Playbook (the Playbook) outlines the actions Philadelphia is taking to respond to climate change through 2050. It brings together actions from existing plans across City departments. This provides a more comprehensive view of how we are working to achieve our climate goals. **The Playbook also outlines how climate change will impact Philadelphia and where we need to go further to achieve our goals.**

The Playbook outlines climate actions in three areas:

1

Reducing our Contribution to Climate Change

Actions to reduce carbon pollution.*

2

Utilizing Nature as a Solution to Climate Pollution

Actions to remove carbon pollution from the atmosphere.

3

Adapting to a Changing Climate

Actions to prepare Philadelphia for a hotter, wetter future.

**These come from three main sources: Buildings and Industry, Transportation, and Waste.*

What the Playbook IS NOT:

The Playbook is NOT a new plan. The Playbook pulls together proposed actions from existing City plans. There are no new actions provided in the Playbook as of October 15th, 2020.

How the Playbook Should Be Used:

The Playbook is a one-stop resource for anyone interested in learning more about climate action in Philadelphia. It is a living document which will be updated as new plans and resources become available.

Philadelphia and Climate Change

PHILADELPHIA CONTEXTUAL SUMMARY

The City of Philadelphia is the urban center of the "Greater Philadelphia" region. This is a region made up of 12 counties across four states: Pennsylvania, New Jersey, Delaware, and Maryland as defined by the U.S. Census Bureau[1]. The city straddles two rivers, the Schuylkill River and the Delaware River. Philadelphia also benefits from Fairmount Park, which at roughly 9,200 acres, is the nation's largest urban park.

Philadelphia is in a humid continental climate zone. This means we experience four distinct seasons, including hot summers and cold winters. Historically, winters have an average temperature of 41.9°F, and summers have an average temperature of 84.5°F (for the years 1961 to 2000). Precipitation is consistent throughout the year, with the greatest amounts occurring during the spring and summer. For more information visit Useful Climate Science for Philadelphia.

Population Characteristics of Philadelphia, 2018[2]

	PHILADELPHIA	PENNSYLVANIA	UNITED STATES
POPULATION			
Total Population (estimates, July 1, 2019)	1,584,064	12,801,989	328,239,523
Population growth – April 1, 2010 to July 1, 2019	3.8%	0.8%	6.3%
Households, 2014-2018 (count)	594,778	5,025,132	119,730,128
CHARACTERISTICS			
Persons under 18 years	21.6%	20.6%	22.3%
Persons 65 years and over	14%	18.7%	16.5%
Female persons	52.7%	51%	50.8%
Foreign born persons, 2014-2018	13.9%	6.8%	13.5%
With a disability, under age 65 years, 2014-2018	12.4%	9.8%	8.6%
Persons without health insurance, under age 65 years	8.7%	6.7%	10%
RACE			
Black	43.6%	12%	13.4%
White	34.3%	75.5%	60.1%
Hispanic or Latino	15.2%	7.8%	18.5%
Asian	7.8%	3.8%	5.9%
American Indian and Alaska Native	0.9%	0.4%	1.3%
Native Hawaiian and Other Pacific Islander	0.2%	0.1%	0.2%

Continued on next page.

[1]City of Philadelphia (2011). *Citywide Vision: Philadelphia 2035*. Retrieved from [https://drive.google.com/file/d/1gGEqfOR_WUWD3pgkc7TVyBHxzpvm4HLj/view]

[2]U.S. Census Bureau (2018). American Community Survey, 2018.Retrieved from [https://data.census.gov/cedsci/table?q=philadelphia&tid=ACSST5Y2018.S0101&hidePreview=false]

FAMILIES & LIVING ARRANGEMENTS			
Owner-occupied housing unit rate, 2014-2018	53%	69%	63.8%
Language other than English spoken at home, percent of persons age 5 years+, 2014-2018	23.1%	11.3%	21.5%
Households with a computer, 2014-2018	84.1%	86.5%	88.8%
Households with a broadband Internet subscription, 2014-2018	73.7%	79.2%	80.4%
EDUCATION			
High school graduate or higher, percent of persons age 25 years+, 2014-2018	83.9%	90.2%	87.7%
Bachelor's degree or higher, percent of persons age 25 years+, 2014-2018	28.6%	30.8%	31.5%
INCOME & ECONOMY			
Median household income (in 2018 dollars), 2014-2018	$43,744	$59,445	$60,293
Per capita income in past 12 months (in 2018 dollars), 2014-2018	$26,557	$32,889	$32,621
Labor force participation, population age 16 years+, 2014-2018	60.6%	62.6%	62.9%
Persons in poverty	24.3%	12%	11.8%
Households with a broadband Internet subscription, 2014-2018	73.7%	79.2%	80.4%
GEOGRAPHY & TRANSPORTATION			
Population per square mile, 2010	11,379.50	283.9	87.4
Land area in square miles, 2010	134.1	44,742.70	3,531,905.43
Mean travel time to work, workers age 16 years+, 2014-2018 (minutes)	33.4	26.9	26.6

Disclaimer: The following statistics are not reflective of the impact of Covid-19, and may have changed.

POPULATION–Philadelphia reached a low of 1,488,710 residents in 2006. Philadelphia began to recover, and as of 2019 there were 1,584,064 residents. This trend of population growth is expected to continue to 1,696,133 residents by 2045. Philadelphia is racially and ethnically diverse–40 percent non-Hispanic Black, 34 percent non-Hispanic white, 15 percent Hispanic, and 7 percent Asian. Philadelphia remains fairly segregated with one race or ethnic group representing the majority in 84 percent of the city's 381 census tracts.

JOB GROWTH–Over the last three years, Philadelphia has outperformed the national average in job growth rate. The city had approximately 724,000 jobs in 2018, an increase from the 657,000 it had in 2010. However, this recent growth is not the norm for Philadelphia. Before 2016, Philadelphia was behind the national average, and its 10-year average for job growth lags behind as well.

POVERTY—Philadelphia has a high poverty rate – the second highest rate among the 20 largest U.S. cities. But, the poverty rate has begun to decline. According to the American Community Survey, in Philadelphia the poverty rate in 2019 was 23.3 percent. This is an improvement from 25.7 percent in 2016. The poverty rate for non-white Philadelphians is much higher than the rate for white Philadelphians. This disparity has been consistent since 2012.

LABOR FORCE AND UNEMPLOYMENT—The unemployment rate peaked in July 2012 at 12 percent as the recession took its toll. Today, that rate has been cut in half. The number of Philadelphians in the labor force has increased since 2010, rising from 668,000 to 707,000 in 2018[3].

HEALTH—Life expectancy varies by neighborhood in Philadelphia. Disparities of up to 20 years exist between neighborhoods which are just a mile apart. Areas with lowest health outcomes are those experiencing a multitude of factors, including high rates of asthma, obesity, cardiovascular disease, and substance abuse[4].

[3] City of Philadelphia (2019). *Growing with Equity: Philadelphia's Vision for Inclusive Growth*. Retrieved from: [https://www.phila.gov/media/20190502112652/Growing-With-Equity.pdf]

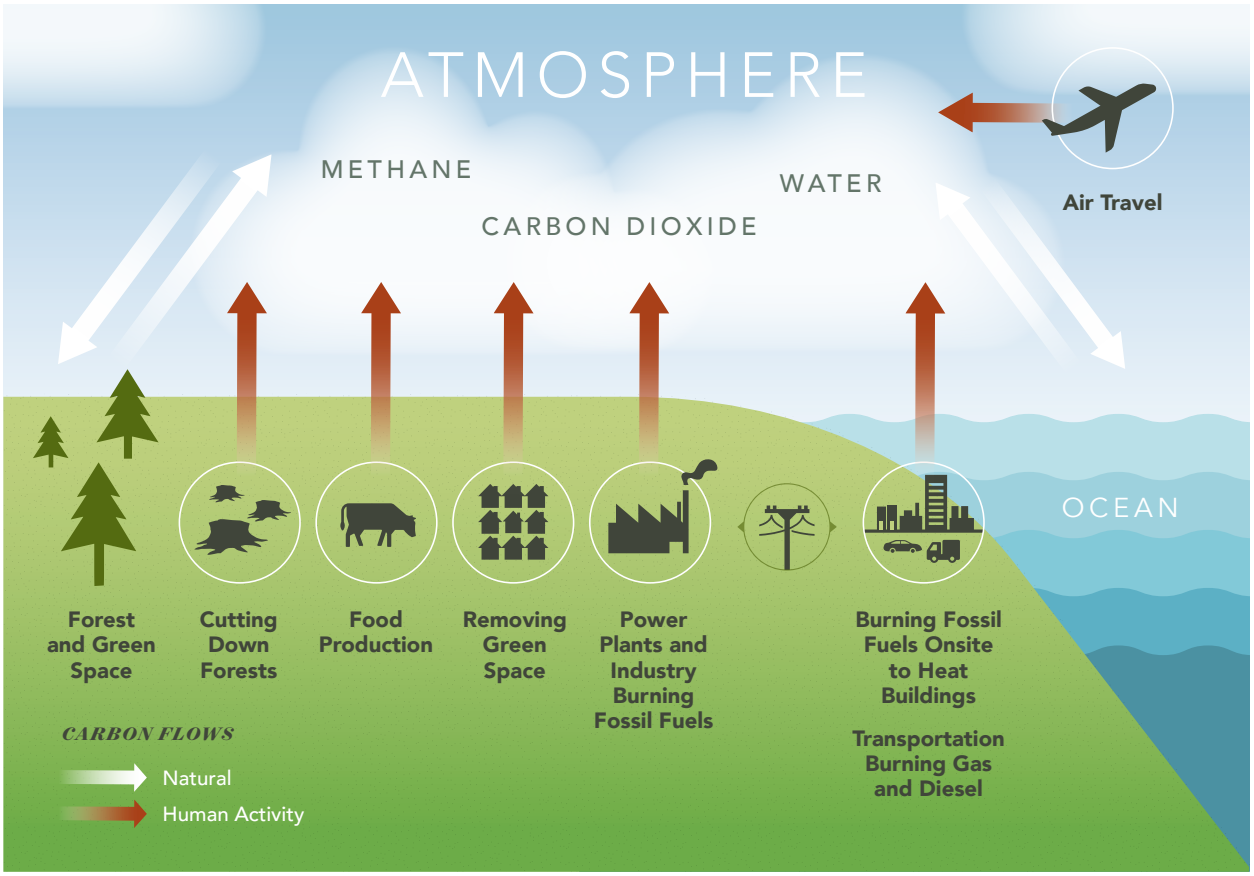
[4] Philadelphia Department of Public Health (2019) Health of the City 2019: Philadelphia's Community Health Assessment. Retrieved from: [https://www.phila.gov/media/20191219114641/Health_of_City_2019-FINAL.pdf]

CLIMATE CHANGE IN PHILADELPHIA

What is Climate Change?

In the past, the natural carbon cycle kept our planet at a steady temperature. Since the Industrial Revolution, humans have changed this cycle by burning fossil fuels at a rapid rate. Fossil fuels include things like coal, oil, natural gas, and gasoline that we burn for energy and heat. Burning these fuels release gases such as carbon dioxide and methane. These gases and others are called greenhouse gases (GHGs) and trap heat in the atmosphere. The rise in GHGs has had major impacts including higher temperatures and more extreme weather patterns.

THE CAUSES OF CLIMATE CHANGE



Human activity in Philadelphia and worldwide have altered the natural carbon cycle while warming the planet.

WHAT PHILADELPHIANS THINK ABOUT CLIMATE CHANGE:

The Philadelphia Office of Sustainability (OOS) conducted a survey to understand how Philadelphians respond to climate change in their homes and communities.

Equity Impacts

In Philadelphia, environmental harms still threaten too many communities. Longstanding challenges of systemic racism have led to differences between neighborhoods. Pollution and industrial areas are most likely to be in Black, Brown and low-income neighborhoods. The same areas are less likely to have green land cover like parks and gardens. These differences contribute to inequality in health and wellbeing.

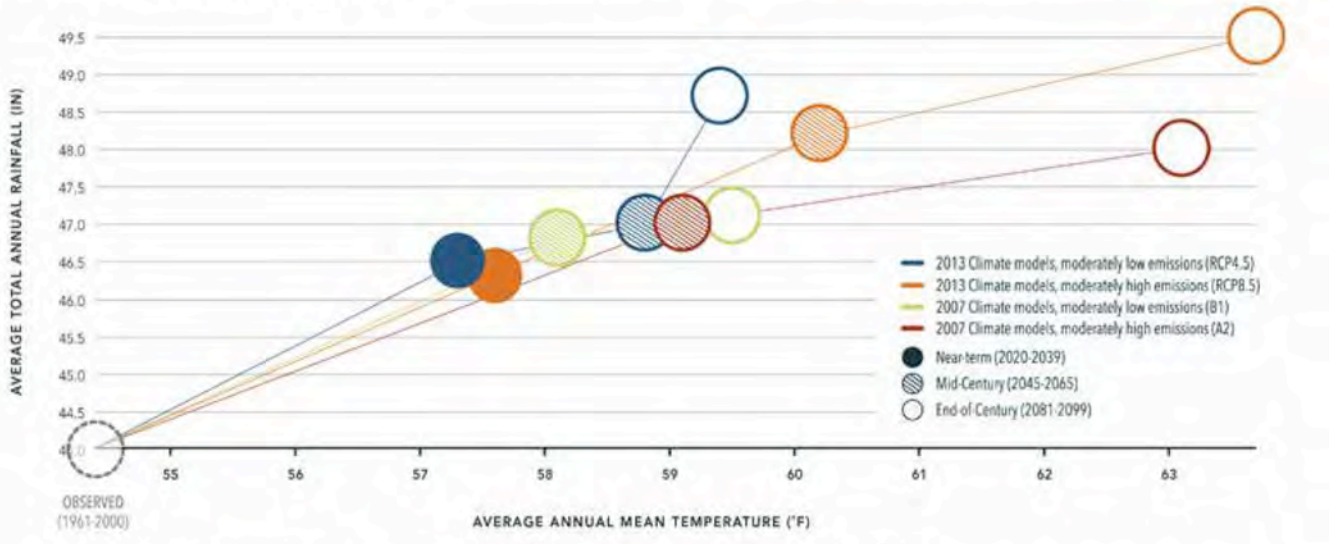
The impacts of climate change will be felt by these frontline communities first and worst. The actions outlined in this document contribute to building climate resilience. They can also build a more just Philadelphia, one where every resident thrives regardless of their zip code.

Environmental Impacts

In Philadelphia, climate change will have two major impacts: hotter temperatures and more precipitation. Already, residents in the city have noticed our summers getting hotter. In the 1900's we had an average of four days above 95°F annually. By 2100, that number could reach up to 52 days . In 2015, OOS and the Philadelphia Department of Public Health (PDPH) collected data to create the Philadelphia Heat Vulnerability Index. This showed that some neighborhoods can be up to 22°F hotter than others. These hotter neighborhoods are more likely to be low-income communities and communities of color.

Along with the increase in temperature will be an increase in precipitation. There will be more rain in the warmer months, and increased snowfall during winter. The depth and extent of flooding will increase along the Schuylkill and Delaware Rivers. This will worsen flooding near the Philadelphia International Airport, in Eastwick, in Manayunk, and in other areas. It will also introduce flooding to new parts of the city. We can also expect more powerful storms like Hurricanes Sandy and Irene, and these storms cost the City hundreds of thousands of dollars to recover from and are a danger to human health.

PROJECTED CHANGES IN AVERAGE ANNUAL TEMPERATURE AND TOTAL ANNUAL PRECIPITATION IN PHILADELPHIA, UNDER FOUR CARBON EMISSIONS SCENARIOS



Scenarios RCP4.5 and B1 assume relatively low emissions, while RCP8.5 and A2 assume moderately high emissions.[4]

Images (clockwise, from top left) of the Schuylkill River in its current state, an actual photo during Hurricane Irene, a simulation of four feet of sea level rise, which is the expected sea level rise in 2100 under a scenario of moderate greenhouse gas emissions, and a simulation of four feet of sea level rise plus a Category 1 storm, which is the expected sea level rise in 2100 plus the most severe hurricane the region has ever experienced. (The sea level rise and hurricane scenario does not include overland flooding, only coastal water storm surge traveling up the river. Actual flooding will likely be higher due to additional flooding from upriver rainfall.)

Health Impacts

The PDPH conducted an analysis of the public health impacts of climate change in our city. They found that hotter temperatures will increase the occurrences of:

- Heat related illness, including dehydration and heat stroke
- Heat-related mortality
- Respiratory disease exacerbation

More storms and precipitation will increase the occurrences of:

- Injuries
- Displacement and mental stress
- Respiratory disease exacerbation
- Vector and water borne diseases

These impacts will hit vulnerable residents such as the elderly, children, and people of low socioeconomic status the hardest. More information about these impacts can be found in PDPH's Climate and Health Adaptation Plan, which is in progress.

Economic Impacts

Climate change will cost our city. Increases in severe weather will bring the most noticeable economic burden. Hurricanes and severe weather events are estimated to cost the City anywhere from $200,000 - $2,000,000 to recover from. Climate-change induced health impacts are projected to cost the city $20,000,000 by 2050. The increase in average temperature is projected to raise annual air conditioning costs in the city by $1,000,000 annually.

Further, these costs will not be incurred equally. The electricity costs associated with more cooling needs will burden low-income residents who spend a higher percentage of their income on energy bills. Residents in areas of frequent flooding will incur property damage and associated costs.

How Can We Become More Climate-Resilient?

While the impacts are daunting, climate change is also an opportunity to rethink our systems and infrastructure. It will take action and cooperation on every level, from the grassroots to large institutions, to achieve our climate goals. Many are already doing the work to build a more climate-resilient Philadelphia. They are:

- Young people marching for climate justice
- Residents growing fresh food in their community
- Neighbors checking on neighbors during heat waves and extreme cold
- Organizers advocating for a clean energy grid and green economy
- Businesses reducing their waste and committing to a living wage
- Building owners making plans to increase their energy efficiency
- Artists, educators, and faith leaders building climate resiliency in communities

The strategies included in this Playbook can also build toward a more resilient, thriving future.

- More green land cover such as parks and gardens provides shading and cooling during extreme heat.
- An urban agriculture network provides fresh food to more households and lowers our food related emissions and waste.
- Retrofitting homes for energy efficiency lowers costs to keep households cool and dry.
- The Green Economy offers opportunities for stable living wage jobs.
- An efficient public transit network helps improve air quality and decrease commute times.

More Information

More information on the impacts of climate change in our region can be found in:

- Useful Climate Information for Philadelphia: Past and Future – Climate change projections for our region, specifically around flooding, storms, and extreme heat (2014)
- Growing Stronger: Toward a Climate-Ready Philadelphia – Philadelphia's Municipal climate change adaptation plan (2015)

PHILADELPHIA'S CARBON FOOTPRINT

Sources of Emissions

OOS measures and tracks Philadelphia's carbon footprint. According to the most recent inventory, Philadelphia's emissions come from three major sources: Buildings and Industry, Transportation, and Waste.

Buildings and Industry, and the energy that supplies them, account for 75 percent of total GHG emissions in Philadelphia. Most buildings are powered by our regional electricity grid. This electricity is produced by a mix of methods, including burning fossil fuels. As an older city, much of our building stock is aging and needs investment to become more energy efficient and resilient.

Transportation is the second largest source of GHG emissions in Philadelphia at 22 percent. When vehicles burn diesel or gasoline to power their engines, they release GHGs into the atmosphere. Philadelphia's transportation emissions are low in comparison to other major cities. This is thanks to Philadelphia's walkability and public transit infrastructure. Still, transportation by single-occupancy vehicle, the most carbon intensive transit option, has increased in the past several years.

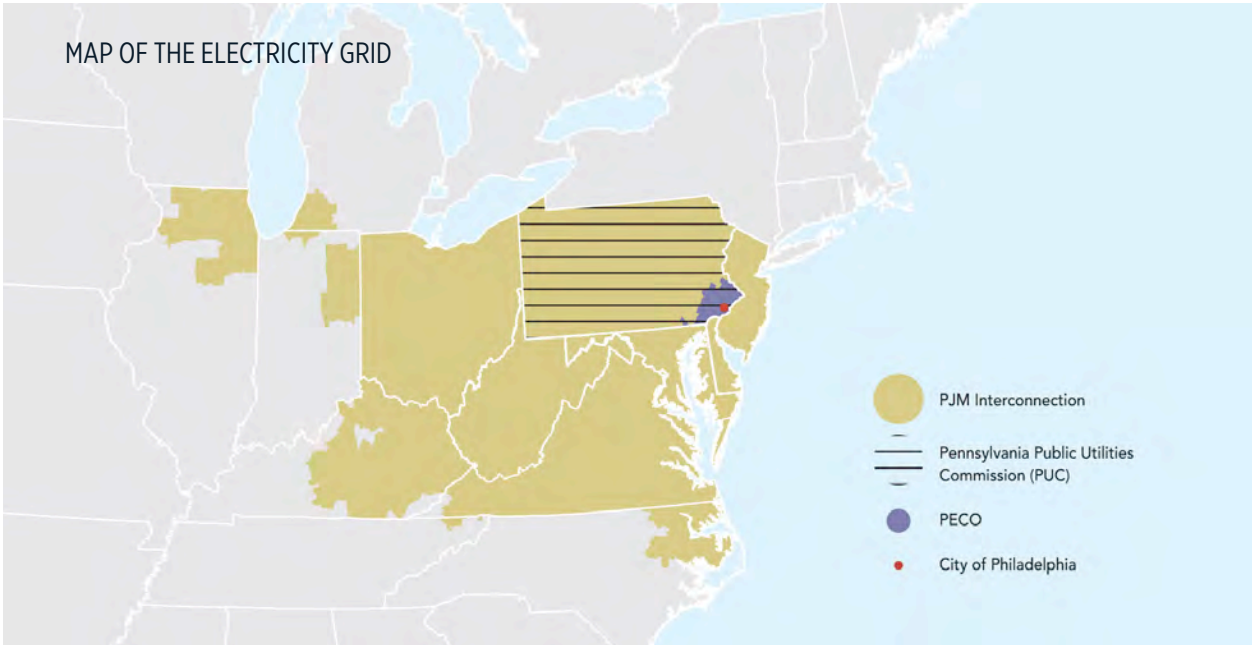
Waste accounts for 3 percent of GHG emissions. Philadelphia disposes of close to 1.5 million tons of waste per year. Most of this is sent to landfills, incinerators, or recycling facilities. Processing this waste is energy intensive and releases GHGs.

How Emissions are Calculated

OOS follows the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) to calculate emissions. These are international standards defined by the World Resources Institute (WRI), C40, and ICLEI - Local Governments for Sustainability. Cities can account for three different groups of emissions. These groups are called 'Scopes'. For all three scopes, a significant amount of data gathering is needed to produce accurate models. This requires collaboration between OOS and many major institutions in the city.

Scope 1 emissions are those which come from primary sources located within the city boundary. These can include emissions related to industry, transportation, and other emissions generated within city limits. If there is any in-city energy production this would be accounted for in Scope 1. Philadelphia Gas Works (PGW), the country's largest municipally owned utility, is included in Scope 1 for emissions for natural gas.

Scope 2 emissions come from the use of energy produced regionally but used within the city boundary. This is often energy that comes from the regional electricity grid that is used by buildings and street lighting. OOS tracks energy use in large buildings through the Energy Benchmarking Program.



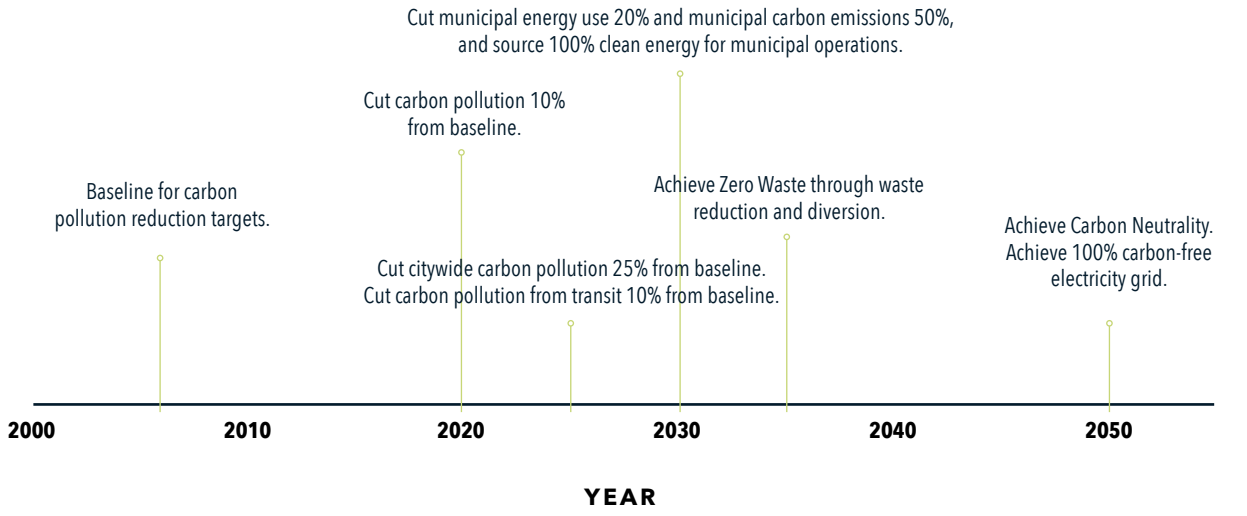
The electricity we use in Philadelphia is generated across the regional electricity grid, and several entities are collectively responsible for providing our electricity:

- *PJM Interconnection: PJM operates the wholesale electricity marketplace across 13 states and the District of Columbia.*
- *Pennsylvania Public Utilities Commission (PUC): Electricity is regulated at the state level by the PA PUC. The PUC sets rates and manages programs to improve energy efficiency and promote renewable electricity.*
- *PECO: PECO is the distribution company in Philadelphia.*
- *City of Philadelphia: The City has a strong working relationship with PECO and regularly files comments on relevant proceedings with the PUC.*

Scope 3 emissions are those which occur outside the city boundary because of activities taking place within the city. This means waste and transport that originates in the city but whose destination is outside of the city. For Philadelphia and many other cities across the globe, Scope 3 emissions are not calculated as they involve a larger amount of guesswork than Scope 1 and Scope 2 emissions.

Carbon Reduction Goals

TIMELINE OF GHG REDUCTION GOALS



In 2021, Mayor Kenney announced the City of Philadelphia's commitment to achieving carbon neutrality by 2050. A carbon neutral city generates net-zero greenhouse gas emissions in the buildings, energy, transportation, and waste sectors. Previously, he also signed the Mayors for Clean Energy pledge to transition Philadelphia to 100 percent clean energy.

Philadelphia also joined C40 Cities; Deadline 2020 Initiative. This is a commitment from some of the world's largest cities to deliver on the Paris Climate Agreement. By 2020, each city will produce a plan or guide like the Playbook, which outlines climate actions to prevent the worst impacts of climate change while strengthening community resilience. We know now that meeting the 80x50 goal is not enough to prevent the worst impacts of climate change, and are examining opportunities to go further.

History of Climate Planning in Philadelphia:

2007

A group of City agencies come together to create a ***Local Action Plan for Climate Change.***

2008

The Mayor's Office of Sustainability (MOS) is established under the administration of Mayor Michael Nutter.

2009

City publishes ***Greenworks Philadelphia***, a plan to create a more sustainable Philadelphia.

PWD releases ***Green City, Clean Waters*** the City's program to control Combined Sewer Overflows using green stormwater infrastructure (GSI).

2011

The **Food Policy Advisory Council** (FPAC) is established to address the city's food challenges and provide policy recommendations to the Mayor.

2014

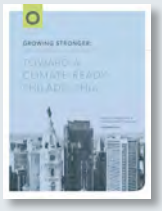
The **Office of Sustainability** (OOS) is made a permanent office within City government by City charter amendment.

OOS issues ***Useful Climate Information for Philadelphia: Past and Future*** to better understand how climate change will impact the city.

PWD establishes the **Climate Change Adaptation Program** (CCAP).

2015

The City of Philadelphia convened the **Flood Risk Management Task Force** to coordinate an interagency response to address the circumstances of flooding in Philadelphia neighborhoods.



OOS produces ***Growing Stronger: Towards a Climate Ready Philadelphia*** to begin the process of preparing City infrastructure for a changing climate.

OOS issues ***Options for Achieving Deep Reductions in Carbon Emissions in Philadelphia by 2050***, prepared by Drexel University.

2016

OOS issues ***Greenworks: A Vision for a Sustainable Philadelphia***, updating the City's sustainable framework around eight key vision areas

Mayor Kenney signs Executive Order 13-16, creating the **Zero Waste and Litter Cabinet**

The Philadelphia Energy Authority establishes the ***Philadelphia Energy Campaign***

2017

The Zero Waste and Litter Action Plan is released, moving the city forward to achieve a 90 percent waste reduction by 2035.

The Philadelphia Water Department (PWD) issues ***The Utility Wide Strategic Energy Plan*** outlining the utility's commitment to the 80x50 goal, as well as their own clean energy projects.

2018

The Office of Transportation, Infrastructure, and Sustainability (OTIS) issues ***Connect: Philadelphia's Strategic Transportation Plan***. The plan outlines efforts to reduce carbon emissions from transportation 10 percent by 2025.

PHL Airport builds upon their ReNEW Sustainability program with ***RePHL***, an energy plan which aligns Airport planning and operations with the City's deep GHG reductions targets.

OOS releases ***Powering Our Future: A Clean Energy Vision*** for Philadelphia laying out ongoing and proposed efforts to slash carbon emissions from Philadelphia buildings and infrastructure.

EO releases the ***Municipal Energy Master Plan***, laying a path to reduce carbon emissions from the municipal built environment by 50 percent and to move to 100 percent clean electricity by 2030.

The Streets Department issues the ***Organics Diversion Feasibility Study*** to examine how to eliminate organics from the waste stream.

OTIS releases the ***Electric Vehicle Policy Task Force Recommendations***.

2018 continued

The City appoints its first **Floodplain Manager** to oversee flood preparedness and damage reduction, public information, mapping, and regulations.

2019

OOS releases the ***Beat the Heat Hunting Park: A Community Heat Resilience Plan***—a resource for communities to build heat resilience in their neighborhoods and adapt to the warming climate.

PDPH completes two sections of the ***Climate and Health Adaptation Plan***: Extreme Heat and Coastal Storms and Flooding

2020 and beyond

OOS established the position of **Chief Resilience Officer (CRO)** to begin the process of a citywide climate change adaptation plan.

PDPH is preparing subsequent sections of its ***Climate and Health Adaptation Plan***.

OOS is establishing the City's first **Environmental Justice Advisory Commission**, which will provide recommendations to address disparate environmental harm throughout Philadelphia.

Parks and Recreation is developing an ***Urban Agriculture Strategic Plan*** and an ***Urban Forest Strategic Plan***.

OTIS is developing a ***Public Transit Strategic Plan***.

OOS is working with the Office of Fleet Management to create a ***Municipal Clean Fleet Plan***.

OOS is developing a **business diversification** study for Philadelphia Gas Works (PGW).

PWD is developing **Planning & Design Guidance** with climate change considerations.

Departments not included in this timeline are also working towards a thriving city. They develop programs to reduce violence, increase economic opportunity, and provide a quality education for all. In the development of the Climate Action Playbook, the OOS reviewed plans from across the City to assess how climate action can help support these goals. The results are the Co-Benefits Matrix. The matrix assesses each climate action across four action areas: Equity, Health, Environment, and Economy.

The efforts of these plans in action have resulted in several accomplishments, many of which are tracked through the OOS Greenworks Dashboard. OOS also publishes stories of Philadelphia's sustainability accomplishments through the Greenworks Review Magazines. Find examples of key successes highlighted throughout the Playbook.

Climate Action Areas

This playbook comprises a portfolio of climate actions Philadelphia will pursue in 2020 and beyond. The playbook is divided into three areas:

1

Reducing our Contribution to Climate Change

Actions to reduce carbon pollution.*

2

Utilizing Nature as a Solution to Climate Pollution

Actions to remove carbon pollution from the atmosphere.

3

Adapting to a Changing Climate

Actions to prepare Philadelphia for a hotter, wetter future.

KEY

- FULL BENEFIT
- PARTIAL BENEFIT
- NO BENEFIT
- NOT ASSESSED

						EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	SECTOR	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE	BUILDINGS AND INDUSTRY	1	Citywide Clean Electricity Supply	Work towards a 100% clean electricity grid through local renewable energy purchasing and generation. Advocate at the State, Regional and Federal level for clean energy production and policies that open markets to clean energy. Explore renewable energy projects in key utilities and infrastructure such as PWD and PHL.	EO, OOS	■	◧	□	■	■	□	□	◧	□	■	◧	◧	◧	◧	n/a

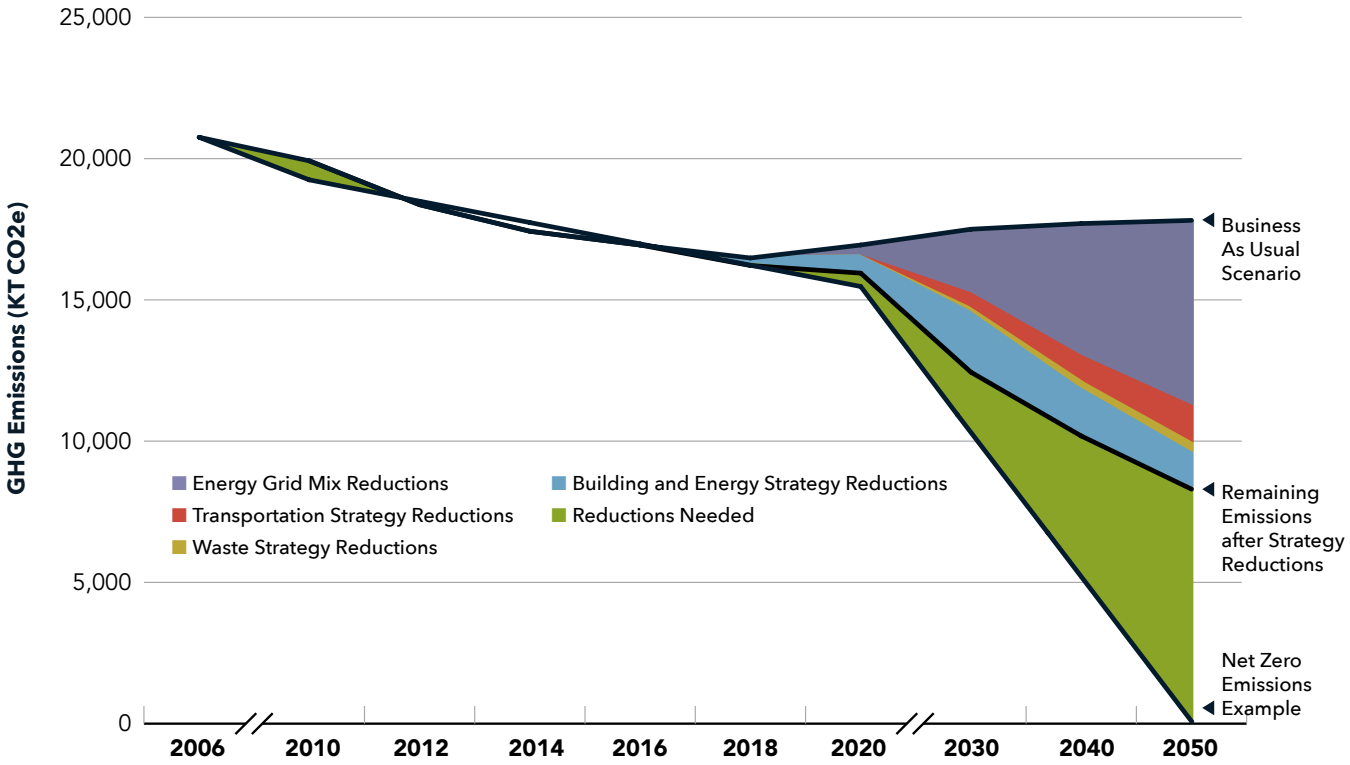
Each chapter contains a matrix of climate actions. For each climate action, the lead and supporting partners are listed. An analysis of each action's equity, health, environmental, and economic impacts was conducted and the results are shown in the co-benefits matrix to demonstrate how climate actions support the priorities and address the challenges unique to Philadelphia. Below the matrix, further descriptions around co-benefits are included, as well as measurable goals and metrics and what plans they come from. We also outline state and federal actions that can help support or enable Philadelphia's climate action goals.

Refer to the "Key Documents" sections throughout for clickable links to relevant reports.

Monitoring the Playbook: OOS conducts a citywide GHG inventory every two years at which time staff will assess the progress of actions included in the Playbook and incorporate new actions that the City is taking to address climate change. These assessments will be published publicly as bi-annual updates.

REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE

The following pages outline actions to reduce our contribution to climate change by eliminating our carbon emissions from three sectors: Buildings and Industry, Transportation, and Waste.



The chart above illustrates the carbon reduction potential from the actions proposed across these sectors. It also shows where the City needs to go further to achieve our goals. Included in each sub-sector heading is an analysis that shows the GHG reduction potential of distinct actions. Assumptions included in this analysis are included in appendix 2.

Buildings and Industry

Buildings and industry account for 75 percent of Philadelphia's carbon emissions.

						EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	SECTOR	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE	BUILDINGS AND INDUSTRY	1	Citywide Clean Electricity Supply	Work towards a 100% clean electricity grid through local renewable energy purchasing and generation. Advocate at the State, Regional and Federal level for clean energy production and policies that open markets to clean energy. Explore renewable energy projects in key utilities and infrastructure such as PWD and PHL.	EO, OOS	■	◧	□	■	■	□	□	◧	□	■	◧	◧	◧	◧	6491800
		1A	Citywide Solar	Pursue actions to address the barriers to solar installation, including cost and regulations, while promoting rooftop solar and solar in new construction. Continue to advocate on State actions which further enable solar in the city and region.	EO, OOS, PEA	□	■	■	⊘	⊘	□	□	□	□	■	◧	◧	■	◧	n/a
		1B	Municipal Clean Electricity Supply	Generate or purchase all municipal electricity from renewable sources. Implement rooftop solar photovoltaic installations on City facilities where feasible. Explore opportunities to install geothermal heating, cooling, and hot water systems in City facilities.	EO	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	⊘	■	◧	◧	◧	■	n/a

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						EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	SECTOR	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE	BUILDINGS AND INDUSTRY	2	Energy Efficient Buildings	Increase energy efficiency in the built environment through building tune-up legislation and energy benchmarking. Continue to stay up to date with international building codes. Leverage the Philadelphia Home Repair and Weatherization programs to help low-income residents increase energy efficiency and comfort in their homes. Support the energy efficiency of key utilities and infrastructure.	EO, OOS, PCPC	☐	■	■	■	◧	■	■	☐	☐	■	■	■	■	◧	1927600
		2A	Lower Municipal Energy Use	Reduce municipal energy consumption through implementation of best practices in building management, large scale energy performance contracts, and roll out of LED Street lighting citywide. Continue to ensure energy efficiency is central in Capital and Rebuild projects. Leverage the Energy Efficiency and Sustainability Fund to increase energy efficiency in municipal buildings.	EO	☐	◧	☐	◧	☐	☐	☐	☐	☐	■	■	■	■	■	n/a

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Co-Benefits

EQUITY – Energy efficiency and home repair can lower energy costs for low-income residents. There are opportunities to lower the costs and barriers to residential solar installation for low-income households.

HEALTH – Investment in clean energy can help reduce pollution from fossil fuel energy production. This can improve air quality for more breathable air. Energy efficiency upgrades can improve indoor air quality and make cooling more affordable.

						EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	SECTOR	CODE	CLIMATE ACTION	DESCRIPTION	DEPARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE	BUILDINGS AND INDUSTRY	3	Low Carbon Thermal Energy	Low-carbon thermal energy - Explore and invest in low-carbon alternative energy sources by tracking technological developments, evaluating implementation opportunities, promoting geothermal heating and cooling systems and solar heat systems. Evaluate operations of Philadelphia Gas Works (PGW), the nation's largest municipally owned utility, for potential emissions reductions.	EO, OOS	☐	◪	◪	◪	◪	◪	☐	☐	☐	■	◪	◪	◪	■	1196900
		4	Low Carbon Economy	Low Carbon Economy - Hasten the development of a low carbon economy through energy collaboration with large regional businesses and institutions through the Climate Collaborative of Greater Philadelphia. Educate around industrial emissions. Reduce emissions from the port of Philadelphia.	EO, OOS, Port	☐	◪	◪	◪	◪	◪	☐	☐	☐	■	◪	◪	◪	■	2450000

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ENVIRONMENT – Fossil fuels are a major contributor to climate change. Reducing fossil fuel use helps prevent the worst impacts of climate change. Further, a move away from fossil fuel extraction and fracking will help prevent environmental degradation, including impacts on air and water quality. Fossil fuels are a major contributor to climate change. Reducing fossil fuel use helps prevent the worst impacts of climate change.

ECONOMY – Jobs in clean energy infrastructure, building retrofits and energy efficient new construction will help support a growing construction job market in the years to come. It will also save building owners and tenants capital in operating costs.

Highlight: Building Energy Performance Policy

At the end of 2018, Philadelphia was selected as one of 25 participants in the Bloomberg American Cities Climate Challenge. This is an initiative designed to help cities meet their commitment to reduce carbon pollution. Thanks to support from Climate Challenge partners at the Natural Resources Defense Council and Institute for Market Transformation, City Council passed and Mayor Kenney signed a new Building Energy Performance Policy into law in December 2019.

The Building Energy Performance Policy mandates all non-residential buildings 50,000 square feet and larger to either:

1. Submit a certification of high-energy performance to OOS or
2. Conduct a tune-up to bring existing building energy systems up to a state of good repair.

Tune-ups are small tweaks to existing systems that save money for building owners and increase comfort for tenants. OOS has estimated that the policy will create as many as 600 new local jobs in Philadelphia. Once fully implemented, it will cut carbon pollution in Philadelphia by nearly 200,000 metric tons. This is the equal to taking 40,000 automobiles off our roads.

Key Goals and Metrics

- Reduce carbon pollution from the City-owned buildings and street lights 50 percent by 2030. (Municipal Energy Master Plan)
- Reduce City operations' energy use 20 percent by 2030. (Municipal Energy Master Plan)
- Generate or purchase 100 percent of all electricity for City operations from renewable resources by 2030. (Municipal Energy Master Plan)
- Provide critical long-term home repair in 25,000 low and moderate income single and multi-family homes by 2026. (PEA)
- Provide energy and building improvements for 2,500 small food and grocery businesses by 2026. (PEA)
- Reduce School District energy use by 30 percent by 2026. (PEA)
- Create 10,000 jobs in energy efficiency and clean energy projects by 2026. (PEA)
- Achieve a clean electricity grid by 2050. (POF)

State, Regional, and Federal Actions

State actions which could support Philadelphia buildings and industry climate actions:

- Strengthen Pennsylvania's Alternative Energy Portfolio Standard (AEPS) to dictate the requirements of 'alternative' energy to mean carbon-free, and increase the percentage of electricity required from these sources above 18 percent of total demand.
- Enter the Regional Greenhouse Gas Initiative (RGGI) to capitalize on greenhouse gas reductions.
- Re-establish the PA Sunshine Program, an incentive established in 2009 under Governor Rendell which provided $100 million in rebates for solar panels on homes and small businesses but has since been unfunded.
- Explore shared and community solar configurations which are currently not allowed in PA. Community solar participants benefit by owning or leasing a part of a solar array, or by purchasing a part of the renewable electricity generation.
- Continue and increase requirements of Act 129 allowing the Public Utilities Commission to impose requirements on electric distribution companies (EDCs), with the goal of reducing energy consumption and demand.

Regional actions which could support Philadelphia buildings and industry climate actions:

- As part of the PJM Cities and Communities Coalition, work to preserve PJM regional grid policies that open markets to low carbon energy resources and solutions, and support PJM governance reforms allowing cities and other end users to weigh in on key decisions affecting their constituencies.

Federal actions which could support Philadelphia buildings and industry climate actions:

- Enact the Clean Power Plan (CPP) or similar program to limit carbon pollution from power plants during the transition to a 100 percent clean grid.
- Renew or replace the 30 percent Solar Investment Tax Credit (ITC) which began to ramp down in 2019.

Timeline and Cost

The Municipal Energy Master Plan (MEMP) outlines strategies with the goal of reducing emissions from the City's built environment 50 percent by 2030. Powering Our Future outlines long-term citywide actions through 2050, and the Clean Energy Vision playbook provides short-term steps to achieve our goals through 2020.

The MEMP also outlines the cost of the actions needed to reach our goal. It estimates that the costs of the actions included will maintain or decrease energy costs for the City. In February 2016, PEA launched its first major initiative, the Philadelphia Energy Campaign, aiming to leverage $1 billion toward energy efficiency and clean energy in the city over the next ten years.

Key Documents

- Philadelphia Energy Campaign, PEA (2016)
- Municipal Energy Master Plan, EO (2017)
- Utility Wide Strategic Energy Master Plan, PWD (2017)
- Powering Our Future: A Clean Energy Vision for Philadelphia, OOS (2018)
    - Clean Energy Vision Action Plan, OOS (2018)
- Philadelphia Gas Works Diversification Study, PGW (ETD 2020)

Transportation

Transportation accounts for 22 percent of Philadelphia's carbon footprint.

						EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	SECTOR	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE	TRANSPORTATION	5	Transit First	Develop a citywide transit plan which expands public and active transit routes and grows regional transit funds. Advocate for development plans and projects which promote public and active transit options.	OTIS, PCPC	■	■	■	■	■	■	□	◧	□	■	■	■	■	◧	145800
		5a	High Quality Bus Network	Transform the bus and trolley service through collaboration with SEPTA to increase ridership, reliability, and accessibility. Continue to identify opportunities to improve transit routes such as the Route for Change Roosevelt Boulevard project.	OTIS, OFM	■	■	■	◧	■	□	□	□	□	■	◧	◧	◧	◧	n/a
		5b	High Quality Bike Network	Implement the Bicycle Network Plan to increase bike routes in the city to 300 miles. Expand the bike share program IndeGo by exploring opportunities for new stations and routes. Continue to increase the safety of bicycling in the city to raise the number of trips taken by bike by 5%.	OTIS, PCPC	■	◧	□	■	■	□	□	◧	□	■	◧	◧	◧	◧	n/a

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Co-Benefits

EQUITY – For many in Philadelphia, public transit is their primary mode to get where they need to go. An equitable public transit system is an affordable network that connects all neighborhoods, demographics, and income levels to jobs and opportunities without increasing the harms of congestion and traffic-related pollution.

HEALTH – Philadelphia has one of the highest rates of traffic deaths per capita in the country. Enhancing public transit helps prevent road-related deaths. Active transit options such as biking and walking provide many health benefits.

ENVIRONMENT – Investments in public transit encourages compact development. Compact development and less pavement cover benefits land, preservation, and air quality. Reduced emissions from private vehicles helps prevent severe climate change.

ECONOMY – Public transit networks help reduce commute times and connect people to jobs and opportunities.

						EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	SECTOR	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE	TRANSPORTATION	6	A Clean Fleet	Continue to transition the municipal fleet to clean and electric vehicles through commitments such as the Climate Mayors Electric Vehicle Purchasing Collaborative and the Clean Fleet Plan. Explore opportunities to reduce idling in the municipal fleet.	OTIS, OFM	◻	◻	◻	◻	◻	◻	◻	◻	◻	◧	◧	◧	◧	■	1113800
		7	Reduced Emissions from Private Vehicles	Continue to implement recommendations from the Electric Vehicle (EV) Policy Task Force report such as EV charging station installation throughout Philadelphia, including at PHL. Support the safety, accessibility, and reliability of alternative modes of transit to promote a mode shift from vehicles to transit more broadly.	OTIS	◧	⊘	⊘	■	◻	◧	◻	◻	◻	◧	◧	◧	◻	◧	■	11200

Highlight: Indego

Indego Bike Network is Philadelphia's bike share program. It launched in 2015 as the city's newest form of public transportation with 60 stations and 600 bikes. It has now expanded to over 130 stations and 1,400 bikes. The program is an initiative of the City of Philadelphia and sponsored by Independence Blue Cross. Indego is part of the Better Bike Share Partnership (BBSP), which seeks to develop bike share equitably across the country. Indego has one of the highest rates of participation among communities of color and low-income households of all bike share programs in the U.S.

In 2019 Indego expanded by adding new stations and providing electric-assisted bicycles as an option for riders. These stations will make Indego more reliable for people who count on the program for their daily transportation. Since its launch riders have taken more than 2.6 million trips, proving bicycle transit is a popular option to get around in Philadelphia.

Key Goals and Metrics

- Increase the number of residents living within 0.25 miles of frequent transit by 10 percent. (Connect)
- Increase bike share trips by 100 percent and those taken by minority or low-income populations by 120 percent. (Connect)
- Reach goal of zero traffic-related deaths by 2030. (Connect)
- Increase transit ridership in Philadelphia by 10 percent vs. the national trend. (Connect)
- Develop a Municipal Clean Fleet Plan. (Connect)

State and Federal Action

State actions which could support Philadelphia transportation climate actions:

- Work with partners such as the Pennsylvania Department of Transportation (PennDOT), Delaware Valley Regional Planning Commission (DVRPC), and SEPTA to secure greater funding for public transit and to coordinate decisions to control congestion and transit demand while keeping our roadways operating efficiently for commuters.
- Follow California's lead and pass a bill requiring zero emissions private vehicles by 2035 to transition cars into the carbon-free future.

Timeline and Cost

Connect is Philadelphia's strategic transportation plan that carries through to 2025. OTIS is developing a plan to identify opportunities to expand and support public transit alongside partners in the region.

Key Documents

- Vision Zero Action Plan, OTIS (2017)
- Connect: Philadelphia's Strategic Transportation Plan, OTIS (2018)
- Energy Action Plan, SEPTA (2018)
- Philadelphia Trail Plan PCPC (2018)
- Municipal Clean Fleet Plan, OOS (Forthcoming)
- Public Transit Plan, OTIS (Forthcoming)

Waste

Waste accounts for only 3 percent of Philadelphia's carbon footprint, yet it is one of the most visible manifestations of carbon consumption and emissions.

						EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	SECTOR	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE	WASTE	8	Reduced Municipal Waste	Identify sustainable procurement opportunities to reduce waste in City government. Monitor and support departmental waste reduction efforts through the Municipal Building Waste Audit Program. Pilot strategies for reducing municipal food waste through the NRDC Food Matters Regional Initiative. Continue to divert organic waste to compost and donation using tools such as the Food Connect app. Work with PADEP and PPR to pilot an urban composting site.	Streets, OOS, Procurement	☐	◧	◧	◧	◧	☐	☐	☐	■	■	■	■	◧	■	21400

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						EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	SECTOR	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
REDUCING OUR CONTRIBUTION TO CLIMATE CHANGE	WASTE	9	Reduced Residential and Business Waste	Continue to work with C40 Cities on the Thriving Cities Initiative to pilot strategies for reducing consumption and expanding circular materials management systems. Engage residents, businesses, and institutions in waste and litter reduction through digital media outreach, grassroots organizing, and education. Promote commercial waste diversion through the Zero Waste Partnership Program. Continue to collect recyclables, and explore the feasibility of citywide compost collection. Launch projects to reduce and divert commercial food waste, prioritizing excess food donation and reuse, as part of the NRDC Food Matters Regional Initiative. Continue to expand the Community Composting Network to support residents' access to composting.	Streets, OOS	◧	■	◧	◧	◧	□	□	■	■	■	■	■	■	■	381300
		10	Reduced Industrial and Utilities Waste	Continue operating the biosolids recycling center through PWD, diverting Aircraft Deicing Fluid from PHL to be used in fertilizer creation. Support PHL in airport composting. Explore further opportunities to reduce waste in key utilities and infrastructure.	PHL, PWD	□	□	□	◧	◧	□	□	□	■	■	■	■	■	■	1800

Co-Benefits

EQUITY – Minimizing waste and illegal dumping, and expanding recycling and composting will help ensure that each Philadelphia neighborhood is clean and cared for.

HEALTH – Landfills and incinerators produce air and water pollution that impact nearby communities. Waste, litter, and illegal dumping attract insects, pests, and rodents that spread disease. Minimizing waste helps protect the health of these communities.

ENVIRONMENT – Landfills and incinerators produce methane, a GHG four times as potent as carbon dioxide. Diesel-powered trash trucks used to haul waste impact air quality. Reducing waste in the city keeps our public spaces and waterways clean of trash, our air clean, and helps prevent climate change.

ECONOMY – Eliminating waste and illegal dumping helps save taxpayer dollars. Incentives such as the Zero Waste Partnership Program and sustainable business tax credit support businesses through marketing, assistance, and financial support.

Highlight: Food Waste

Over the next two years, the City will pursue several projects to tackle food waste. Philadelphia will receive technical assistance from the Natural Resources Defense Council (NRDC) as part of its Food Matters Project. Through this project, Philadelphia will collaborate with four other cities to pilot innovative strategies to tackle food waste locally.

The City is also the recipient of a grant issued by the United States Department of Agriculture. This grant will support PPR's Community Composting Network. It will also support a Food Service Business Challenge by providing technical assistance to 10-15 businesses to implement food waste reduction strategies.

In autumn 2020, PPR will launch the state's first-ever urban composting permit pilot. The site will collect compost from recreation centers citywide free of charge in exchange for rent and utilities.

Key Goals and Metrics:

- Continue to implement the Zero Waste and Litter Action Plan, addressing 100 percent of its recommendations.
- Achieve a citywide waste diversion rate of 90 percent, with the remaining 10 percent of waste being processed through waste-to-energy, by 2035.
- Achieve 100 percent compliance in the Municipal Building Waste Audit Program.
- Eliminate food and organic waste from the landfill and waste-to-energy streams.

State and Federal Actions

State and federal actions which could support waste-related climate action in Philadelphia:

- Support State-level bans of plastic bags and other littered single-use packaging items.
- State-level policy that incentivizes recycling of packaging materials (such as bottle returns and other container deposits), or other source-separated recycling programs. These programs support materials recovery and reduce opportunities for contamination to the recycling stream and therefore may reduce fees that municipalities must pay for single-stream recycling, and incentivize household recycling.
- State-level organic waste bans/food recycling laws and other legislation aimed at minimizing wasted food.
- Support extended producer responsibility (EPR) legislation for goods and packaging at the state and federal levels.

Highlight: Curb Your Waste

The Streets department has developed several tools to help residents manage their waste and the city to reduce emissions. Curb Your Waste provides an array of tips for residential waste management, beginning with waste reduction.

Additionally, a new tool called StreetSmartPHL provides direct access to the Streets Department's core services. PickupPHL monitors trucks in near real time using GPS tracking. It helps facilitate route optimization to reduce fuel consumption and emissions. A grant from The Recycling Partnership, funded by the Closed Loop Partners, will investigate a variety of strategies to support residents to reduce recycling contamination. This will help ensure all recyclables are being processed correctly.

Timeline and Cost

The City pays an average of $66 per ton for trash disposal and $90-110 per ton for recycling. Fluctuations in the price of processing waste and recyclables inform the cost of actions related to GHG emissions reductions from this sector.

The Zero Waste and Litter Action Plan, the City's waste reduction and diversion vision document, outlines the City's Zero Waste strategies and sets the goal of having Philadelphia reach a 90 percent waste diversion rate by 2035, with the remaining 10 percent of waste being processed through waste-to-energy. As this work continues to move forward, new targets that account for current conditions will be set. The City is currently working with the C40 Thriving Cities Initiative to plan for and pilot anti-consumption initiatives and with several other groups to expand circular economy efforts in Philadelphia.

Key Documents

- The Zero Waste and Litter Action Plan, ZWLC (2017)
- Utility Wide Strategic Energy Master Plan, PWD (2017)
- Municipal Waste Management Plan, Streets (2018)
- Litter Index Report, ZWLC (2019)
- Municipal Building Waste Audit Report, ZWLC (2019)

UTILIZING NATURE AS A SOLUTION TO CLIMATE POLLUTION

Land cover like trees and parks helps remove carbon pollution from the atmosphere. Only 20 percent of Philadelphia is tree canopy, while 49 percent of the city could be modified to include more.

					EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
UTILIZING NATURE AS A SOLUTION TO CLIMATE POLLUTION	11	Cleaner Public Spaces	Track litter across all neighborhoods through the Litter Index survey and use data to inform waste interventions. Continue to expand the Community Cans public-private partnership program to improve trash can coverage on commercial corridors. Expand residential access to lidded recycling bins, and implement and enforce new regulatory requirements including requirements for Construction and Demolition Waste Plans on all L&I construction, demolition, and alterations permits.	Streets, PWD, OOS, L&I	☐	■	◧	■	■	◧	◧	■	■	☐	◧	◧	◧	■	n/a
	12	Increased and Preserved Green Space	Continue to increase citywide tree coverage through programs such as TreePhilly and Green City, Clean Waters. Finalize the development of an Urban Forest Strategic Plan to identify opportunities to further incorporate vegetation and tree coverage equitably throughout the city.	OTIS, OOS, PWD, PPR	☐	■	■	■	■	■	◧	■	☐	■	■	■	■	■	n/a

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Co-Benefits

EQUITY – Low-income neighborhoods and communities of color tend to have the fewest street trees and other green spaces in Philadelphia. This impacts neighborhood-level heat and flood resilience. Increasing tree coverage and green spaces in these communities can support resilience to heat and flooding.

HEALTH – Green coverage such as trees, gardens, and parks help manage heat and stormwater runoff, and clean pollutants from the air. Further, proximity to greenery can decrease stress levels and improve general quality of life for residents.

					EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
UTILIZING NATURE AS A SOLUTION TO CLIMATE POLLUTION	13	City Wide Composting	Continue to explore the feasibility of citywide compost collection. Launch Community Composting Network to expand residents' access to composting, and work with PADEP and PPR to test urban composting site, with potential to create the first urban composting permit for the state of Pennsylvania. Support PHL airport in implementing a composting program. Continue to divert organic waste from PPR facilities to composting. Demonstrate opportunities for food waste diversion to commercial and industrial sectors.	OOS, PHL, PPR	☐	■	◧	◧	☐	☐	☐	◧	■	◧	■	☐	■	■	n/a
	14	Carbon Sink Network	Explore the feasibility of further carbon sink options as new technologies and strategies emerge. Advocate for the preservation of current carbon sinks in the region and globally.	OOS	⊘	⊘	⊘	⊘	⊘	⊘	◧	⊘	◧	⊘	⊘	⊘	⊘	⊘	n/a

*Continued on next page.

ENVIRONMENT – Forests absorb CO2, a GHG, from the atmosphere and use it in the photosynthesis process. At the end of this cycle, they then produce oxygen and the air we breathe. Trees and other green infrastructure also help improve local air and water quality.

ECONOMY – According to a study produced by the Sustainable Business Network of Greater Philadelphia, investments in green stormwater infrastructure through PWD's Green City, Clean Waters has supported about 1,000 jobs in the region.

Highlight: TreePhilly

Since 2011 PPR's TreePhilly program has been bringing the urban forest to the yards of Philadelphians. TreePhilly has helped give away more than 22,000 free trees for city residents. These trees can be planted in front yards, back yards, and private community spaces. Although the entire city benefits from tree planting, not every neighborhood has access to adequate green space. Areas with fewer trees need greater investment. To meet the City's goals, TreePhilly is distributing trees through partnerships with community-based organizations around the city. In 2019 TreePhilly received funding from TD Bank to support planting

Key Goals and Metrics

- Develop an Urban Forest Strategic Plan.
- Continue to implement Green City, Clean Waters through 2036.

State and Federal Actions

State actions which could support Philadelphia carbon sequestration related climate actions:

- Consider a State-level requirement such as New York's which requires that some communities expand their composting capacity and infrastructure to introduce a citywide composting program later.
- Protect and preserve state parks and forests.

Federal actions which could support Philadelphia carbon sequestration related climate actions:

- Extend the USDA Farm Bill allotment to test programs for composting in more states.
- Continue to fund the U.S. Department of Energy research into carbon capture, utilization, and storage.
- Protect and preserve national parks and forests.

Timeline and Cost

Green City, Clean Waters is Philadelphia's program to control Combined Sewer Overflow (CSO) primarily using green stormwater infrastructure. The program commitment is more than 1 billion dollars for addressing water quality goals as set by both Pennsylvania and national CSO control policies. These projects will be implemented over a 25-year period, with metrics and milestones developed to measure progress along the way.

Key Documents

- Green City Clean Waters, PWD (2011)
- Urban Forest Strategic Plan (Forthcoming)
- Urban Agriculture Master Plan (Forthcoming)
- Compost Feasibility Study (Forthcoming)

ADAPTING TO A CHANGING CLIMATE

Philadelphia can expect hotter, wetter weather due to climate change, an impact we are already beginning to see. The actions below consider how we will address these changes.

					EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
ADAPTING TO A CHANGING CLIMATE	15	Climate Informed Planning	Create a citywide adaptation roadmap which integrates climate change impacts into future planning. Build upon the municipal adaptation plans in Growing Stronger and PDPH Climate Change and Public Health Plan.	OOS, PCPC, L&I	◧	■	◧	■	■	■	■	■	□	⊠	◧	■	◧	■	n/a
	16	Climate Prepared Communi-ties	Implement recommendations from the PDPH Climate Change and Health Plan to prepare for public health risks induced by climate change. Explore opportunities to build community resilience to these risks through neighborhood level interventions such as Beat the Heat Hunting Park. Continue to convene the interagency Flood Risk Management Task Force.	OOS, PPR, PDPH	■	■	◧	■	■	■	■	■	□	◧	□	■	◧	■	n/a

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Co-Benefits

EQUITY – Climate change impacts will not be felt the same by every neighborhood. Adaptation planning throughout the city will need to address these differentiated impacts. We must also work to reduce the social inequalities which make some populations more vulnerable to these impacts.

HEALTH – Proactive efforts to adapt and prepare for these climate impacts can help prevent future health emergencies. For example, a local food network can buffer against food system disruptions due to a changing climate. Supporting climate resiliency can improve quality of life and well being for all communities.

					EQUITY			HEALTH				ENVIRONMENT			ECONOMY				
	CODE	CLIMATE ACTION	DESCRIPTION	DEPTARTMENT	Mobility	Community capacity	Poverty Reduction	Wellbeing	Public Safety	Heat Preparedness	Flood Preparedness	Green space	Waste Reduction	Carbon Pollution reduction	Jobs	Cost Savings	Competitiveness	Lead by example	GHG REDUCTION BY 2050 FROM 2006 BASELINE
ADAPTING TO A CHANGING CLIMATE	17	Green Workforce Develop-ment	Continue investing in clean energy workforce development through PEA, GreenFutures, and PowerCorpsPHL. Support sustainable business incentives such as the Zero Waste Partnership Program and the sustainable business tax credit.	OOS, PEA, SDP	☐	☐	■	☐	☐	☐	☐	◧	■	◧	■	☐	■	◧	n/a
	18	Local Food Network	Continue to advocate for and support a local food network where all people have the power to access, own and control our food, land, and labor through FarmPhilly, the Urban Agriculture Master Plan, Get Healthy Philly, and the Food Policy Advisory Council.	FPAC, PPR, PDPH	☐	■	◧	■	■	◧	☐	■	■	■	◧	☐	◧	◧	n/a
	19	Engaged Citizens for Climate Action	Through programs such as Greenworks on the Ground and the Citizens Planning Institute and events such as Philly Spring Cleanup, empower Philadelphia residents to take climate action into their home, work, and community.	OOS, Streets, PCPC, PPR	☐	◧	☐	☐	☐	☐	☐	◧	■	◧	☐	☐	■	■	n/a

ENVIRONMENT – Adaptive management can help Philadelphia's parks and gardens flourish in a new climate. Investment in green landcover can help neighborhoods manage flooding and extreme heat.

ECONOMY – Proactive measures to prepare for climate changes can lead to great long-term cost savings. Investments in a climate resilient infrastructure support job creation and protect city assets.

Highlight: Beat the Heat Hunting Park

Hunting Park is a heat vulnerable neighborhood in North Philadelphia with an active environmental advocacy community. OOS teamed up with these advocates and neighborhood organizations, including Esperanza, Hunting Park Neighborhood Advisory Committee, Hunting Park United, Lenfest Center, and North10 Philadelphia to address heat issues.

By working together, the group engaged over 600 residents in an eight-month community engagement process. The core team attended community events, received 530 survey responses and the insights of over 40 residents who participated in a community design workshop. This process led to Philadelphia's first ever neighborhood heat plan. The plan was released in July 2019 to inform residents about what causes extreme heat and to advocate

Key Goals and Metrics

- Develop Citywide Climate Resiliency Strategy (Forthcoming)
- Complete the Urban Agriculture Strategic Plan (Forthcoming)
- Update the Office of Emergency Management's (OEM) Hazard Mitigation Plan (Forthcoming)

State and Federal Actions

State actions which could support Philadelphia adaptation related climate actions:

- Update PA's Climate Change Act (2009) to include more extensive adaptation commitments.

Federal actions which could support Philadelphia adaptation related climate actions:

- Support policies such as the Green New Deal and The Breathe Act which address mitigation and adaptation to climate change and racial equity at the federal level.
- Continue to allow funds from the Disaster Relief Appropriations Act (2013) to be used to install adaptive measures during storm recovery processes.
- Update the Federal Emergency Management Agency's (FEMA) floodplain maps to include the impacts of climate change and Community Identified flood hazard areas.
- Coordinate State/federal permitting activities with local permitting to garner stronger environmental compliance – using state/federal/local regulations to enforce.

Timeline and Cost

The City has begun its Climate Adaptation planning process in 2020 and this work will establish further deadlines. Certain adaptation measures are already underway and will continue such as OOS's heat resilience work. The City is currently exploring adaptation pathways and determining the costs of planning and actions related to these pathways.

Key Documents

- Growing Stronger: Towards a Climate-Ready Philadelphia (2008)
- Eating Here: Greater Philadelphia's Food System Plan (2011)
- Good Eats Report (2019)
- Urban Agriculture Strategic Plan (Forthcoming)
- Citywide Climate Change Adaptation Plan (Forthcoming)

Appendixes

I. DEPARTMENTAL ACRONYMS

EO - Energy Office

FPAC - Food Policy Advisory Counci

L+I - Licenses and Inspectionsl

OOS - Office of Sustainability

OTIS - Office of Transportation, Infrastructure and Sustainability

PCPC - Philadelphia City Planning Commission

PDPH - Philadelphia Department of Public Health

PEA - Philadelphia Energy Authority

PGW - Philadelphia Gas Works

PHL - Philadelphia International Airport

PJM - PJM Interconnection

Port - Port of Philadelphia

PPR - Philadelphia Parks and Recreation

PWD - Philadelphia Water Department

SDP- School District of Philadelphia

SEPTA - Southeastern Pennsylvania Transportation Authority

Streets - Philadelphia Streets Department

II. ASSUMPTIONS IN GHG REDUCTIONS MODELING

The Climate Action Playbook includes GHG reductions projections based on research and modeling completed by the Office of Sustainability (OOS). Listed below are some of the key assumptions that were made to create the analysis shown throughout this report.

GENERAL MODEL ASSUMPTIONS

The Climate Action Playbook uses population projections from Delaware Valley Regional Planning Commission (DVRPC) and assumes current construction rates continue to estimate increase in electricity and natural gas demand through 2050. Current emissions from Philadelphia's built environment are derived from citywide PECO and PGW data along with supplementary information on individual buildings from the City's energy benchmarking program. The modeling in this report assumes a zero-carbon grid is technically feasible, but does not make any assumptions about the technologies or costs required to achieve it.

CLEAN ELECTRICITY SUPPLY

Powering Our Future considers two electricity supply scenarios and assumes carbon intensity (CO2e/MWh) pathways for each scenario. The business-as-usual scenario assumes the carbon intensity of the grid follows the Energy Information Agency's generation fuel mix projections. The clean electricity supply grid scenario assumes the regional electricity grid follows a linear reduction trend to zero carbon emissions in 2050. This scenario does not make assumptions about which technologies or generation sources will be used in the zero-emissions grid.

CITYWIDE SOLAR

Powering Our Future projections for solar generation within the city are based on existing solar panel technology. A study by Penn State University found that nearly half of Philadelphia rooftops are suitable for solar generation, and *Powering Our Future* assumed that 80 percent of these rooftops were producing electricity from solar by 2050. The resulting electricity generation is treated as a portion of the clean electricity supply.

ENERGY-EFFICIENT HOMES AND BUSINESSES

Data from PECO, PGW, and the energy benchmarking program were used as a baseline for modeling programs in the Energy-Efficiency Playbook.

Key assumptions for specific programs include:

- Commercial and Residential Energy Codes: Philadelphia adopts new building codes with each triennial International Code Council update through 2030 and 75 percent of new construction and major renovations completed through 2050 comply with code.
- Residential Energy Code Enforcement for Renovations and Additions: Building codes continue to become more energy efficient through 2030, and all renovations completed through 2050 meet code.
- Third-Party Energy Code Compliance: Compliance rates increase from an estimated 75 percent to 95 percent for residential properties.
- 2030 District: 70 percent of existing buildings in Center City and University City meet the 2030 District targets.
- Permit Streamlining: Streamlining leads to 75 percent of expected new construction meeting LEED or ENERGY STAR standards.
- Density Bonus: 30 new properties take advantage of bonus annually.
- Property Tax Incentives for High-Performing New Buildings: 50 percent of new office space in Center City and University City take advantage of incentives.
- Utility-Funded Efficiency Opportunities: Act 129 savings targets extend to 2050 with an annual savings rate of 1.1 percent.
- Expanded Energy Benchmarking Program: Benchmarking threshold is reduced to 25,000 square feet. 90 percent of buildings comply, and they reduce energy use 2 percent annually.
- Building Energy Performance Program: Program applies to buildings 25,000 square feet and larger, and 75 percent of eligible buildings comply, achieving 10 percent one-time savings.
- City Government Leading by Example: For more on this analysis, see the recently released Municipal Energy Master Plan, available at www.phila.gov/green.

LOW-CARBON THERMAL ENERGY

The Low-Carbon Thermal Energy section assumes that natural gas and fuel oil use for heating, hot water, and cooking will be partially displaced by new no- and low-carbon technologies. The model assumes that 70 percent of residences and 30 percent of commercial buildings will use these new technologies by 2050. The model does not make any assumptions about which technologies will be used.

LOW-CARBON ECONOMY

The city's GHG inventory includes emissions from Philadelphia's local industry. The inventory includes large point source emissions from the EPA's Greenhouse Gas Reporting Program tool and Philadelphia's share of additional industrial emissions from the Pennsylvania Department of Environmental Protection greenhouse gas inventory. The Low-Carbon Economy section assumes that the carbon dioxide-equivalent output of industry is 80 percent lower by 2050.

TRANSPORTATION

The Transportation section utilizes data and modeling from the Drexel 80x50 Report, "Options for Achieving Deep Reductions in Carbon Emissions in Philadelphia by 2050". The model assumes that in a business as usual scenario, passenger vehicle transport will take up 91.5 percent of GHG emissions with the remaining 8.5 percent taken up by transit by 2050. Further, the model assumes that actions taken result in a 10 percent reduction in Vehicle Miles Traveled (VMT) from Business As Usual by 2050, and a consumer EV market share of 88 percent by 2050.

WASTE

The Waste section assumes a 70 percent reduction in municipal, residential, commercial and industrial waste by 2050 from various baselines. Baseline numbers come from the Municipal Waste Management Plan from the Philadelphia Streets Department (Table 1-1, Waste Characterization Data) and the Municipal Building Waste Audit conducted by the Zero Waste and Litter Cabinet. Residential waste characterization percentages are applied to commercial waste totals.

III. CO-BENEFITS DEFINITIONS AND METHODOLOGY

The co-benefits analysis included in the Playbook uses a methodology adapted from New York City's benefits analysis included in the NYC 1.5 Degree Climate Action Plan and outlined in their Action Prioritization Methodology Case Study produced in conjunction with C40.

The four categories of benefits are organized by the co-benefits categories included in Philadelphia's sustainability plan, Greenworks: Equity, Health, Environment, and Economy. Also included is an analysis of the leadership role the City provides for each action. The questions following each co-benefit were used to guide those who completed the assessment as to how each action did or did not support that benefit. Internal OOS staff completed the assessment collaboratively, and then leadership from relevant departments and external partners with expertise in climate relevant areas were asked to review the assessment and provide any recommendations for changes.

Scorers ranked each action under each co-benefit from 0-2. 0 meant there was no benefit, 1 a partial benefit, and 2 a full benefit. The scorer could also place an X if there was not enough information to place an informed assessment. While this methodology is subjective, it provides a framework through which to assess what climate actions can support other goals within Philadelphia and invites deeper analysis.

EQUITY

Mobility – Does this decrease trip duration? Could this increase access to essential services such as hospitals and jobs? Could this improve safety during commutes?

Community Capacity – Could this address health or environmental justice disparities? Could this strengthen social cohesion and emergency preparedness in communities? Could this increase community (lead or co-creation) in planning? Could this limit displacement of residents and small businesses when surrounding property values rise?

Poverty Reduction – Could this reduce or stabilize the energy cost for energy-burdened households? Could this provide job opportunities and training for disadvantaged communities? Could this decrease unemployment?

HEALTH

Wellbeing – Could this increase the comfort and mental health of residents? Could this lead to improvements in the quality and ventilation of indoor spaces (e.g. pest management, or mold)? Could this improve outdoor air quality and reduce incidences of asthma, respiratory, and cardiac problems? Does this promote active modes of transport? Could this increase access to quality food?

Public Safety – Could this minimize disruptions to energy or mobility services during emergencies or natural disasters? Could this improve flood and fire safety? Could this increase access to essential services such as hospitals? Could this reduce violence or crime?

Extreme Heat Preparedness – Could this improve indoor temperature control? Could this mitigate the urban heat island effect? Could this reduce heat risks for vulnerable populations?

Flood mitigation – Could this increase the amount of permeable surface cover? Could this increase flood resilience by preserving and restoring land, protecting waterways, or preventing sewage discharges? Could this help vulnerable households in the FEMA and sea level rise projections prepare for flooding?

ENVIRONMENT

Green Spaces – Could this improve access to green and healthy spaces for community members? Does this prioritize access to green spaces to communities that historically have not had access to them? Could this contribute to the preservation of green space, wildlife habitats, or sensitive ecosystems? Could this expand the benefits of existing green space?

Waste Reduction – Does this limit the primary creation of waste? Does this limit the amount of waste reaching landfills and incinerators? Does this decrease litter in public spaces? Does this allow for an increase in waste diversion?

Carbon Pollution Reduction – Could this reduce peak electricity demand? Does this sequester GHGs? Does this reduce GHG emissions?

ECONOMY

Jobs – Could this generate new, quality jobs? Could this lead to sustained long-term jobs? Could this support growth in key industries for Philadelphia?

Long-term Cost Savings – Could this benefit health outcomes and productivity, leading to reduced citywide healthcare costs? Could this mitigate the risk of property damage to city infrastructure? Could this lead to long-term utility bills or transportation cost savings for households?

Economic Competitiveness – Could this improve workers' skills? Could this increase the number of individuals receiving City-sponsored, industry-focused training? Could this unlock private sector capital, technology adoption, and/or innovation?

LEADERSHIP

Lead by example – Is City government reducing emissions or preparing for climate change? Could this influence actions led by another city, state, or federal entity? Could this increase public awareness of climate change issues?

IV. 2016 GPC COMPLIANT GHG INVENTORY SNAPSHOT

GPC REF. NO.	GHG EMISSIONS SOURCE (BY SECTOR AND SUB-SECTOR)	TOTAL GHGS (METRIC TONNES CO2E)			
		SCOPE 1	SCOPE 2	SCOPE 3	TOTAL
I	**STATIONARY ENERGY**				
I.1	Residential buildings	1,961,892	1,408,165	NE	3,370,056
I.2	Commercial and institutional buildings and facilities	2,153,171	3,223,981	NE	5,377,152
I.3	Manufacturing industries and construction	1,934,119	IE	NE	1,934,119
I4.4.	Energy generation supplied to the grid	766,511			
I.8	Fugitive emissions from oil and natural gas systems	455,886			455,886
SUB-TOTAL					**11,137,214**
II	**TRANSPORTATION**				
II.1	On-road transportation	2,996,443			2,996,443
II.2	Railways	NO	250,065	NE	250,065
SUB-TOTAL					**3,246,508**
III	**WASTE**				
III.1.1./2	Solid waste generated in the city	NO		182,250	182,250
III.3.1/2	Incinerated and burned waste generated in the city	NO		332,723	332,723
III.4.1/2	Wastewater generated in the city	26,140		NO	26,140
SUB-TOTAL					**541,113**
IV	**INDUSTRIAL PROCESSES and PRODUCT USES**				
IV.1	Emissions from industrial processes occurring in the city boundary	1,915,902			1,915,902
IV.2	Emissions from product use occurring within the city boundary	23,365			23,365
SUB-TOTAL					**14,924,834**

KEY:

NO Not occurring

IE Included elsewhere

NE Not estimated

GREENWORKS

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