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GREENOVATE
BOSTON



2014 Draft Climate Action Plan

For Public Comment

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LETTER FROM MAYOR MARTIN J. WALSH

Placeholder

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EXECUTIVE SUMMARY

Climate change presents one of the greatest challenges of our time for both Boston and the world. Boston is particularly vulnerable to the projected impacts—in the past three years, the city faced four storms that nearly resulted in hundred-year flood events. Boston's Climate Action Plan seeks to both reduce our carbon emissions in order to avoid the unmanageable, and prepare for the impacts of climate change that are unavoidable.

Boston is approaching a watershed period for climate action. The City has accelerated its climate preparedness efforts, with, for example, a municipal vulnerability assessment, an international design competition, and the incorporation of climate preparedness in its design review for new development. Meanwhile, carbon reduction efforts across the city have taken off from

energy efficiency to alternative transportation. Plummeting solar prices are accelerating residential and commercial installations across the city. In addition, over 32,000 homes in Boston— equivalent to 12 percent of all homes in the city— have received their no-cost energy assessments. Large buildings have made substantial headway in cutting their energy use, and district energy planning efforts are underway. As a result of Boston's sound policies and programs, Boston was named the number one city for energy efficiency in the country by the American Council for an Energy Efficient Economy, and was recently invited to join the C40 Cities Climate Leadership Group, a global network of megacities working actively to achieve a sustainable, equitable, and low-carbon future.

Via 2007 executive order, Boston's must update its climate action plan every three years. The first community-wide, comprehensive climate action plan was released in 2011 and it sets a vision for a greener, healthier, and more prosperous city. The 2014 Climate Action Plan builds upon the 2011 Plan in five key areas:

- 1) More rigorous greenhouse gas measuring and modeling, and a first look towards our 2050 carbon goal.
- 2) Comprehensive climate preparedness strategies.
- 3) A focus on key cross-cutting themes including social equity, economic development, and public health and safety.
- 4) More extensive and inclusive community engagement process.
- 5) A performance measurement system to measure year-over-

year progress and keep us on track to meeting our goals.

The 2014 Plan focuses on five areas: Neighborhoods, Large Buildings and Institutions, Transportation, Climate Preparedness, and 80x50--a new visioning section that outlines the transformation required to reduce our carbon footprint 80 percent by 2050.

The Plan's development was supported by a Steering Committee, five strategy subcommittees, and the active engagement of thousands of people through neighborhood meetings and events.

Each area of the plan contains strategies and specific actions to

achieve the overarching climate goals. In early 2015, implementation plans for the action items will be developed with continued community input. Because this plan is a living document, implementation details and progress updates will be included on the online version of the Climate Action Plan. The online version also includes a system of rigorous greenhouse gas metrics and targets that connect the strategies to Boston's carbon footprint.

Equally important to reducing our greenhouse gas emissions are the cross-cutting issues and themes that enable meaningful climate action to occur. As the City works to inform its residents on climate change and

greenhouse gases, Bostonians must understand how climate action helps address their near-term needs. Throughout the plan there are references to the importance of community engagement, social equity, public health and safety, and economic development.

The 2014 Climate Action Plan is an important document that will ensure Boston's continued global leadership in reducing greenhouse gas emissions and preparing for climate change. It confirms that Boston will continue to develop into a vibrant and sustainable city for current and future generations, and champion the action needed to meet the global challenge of climate change.

PRIORITIES

Reduce greenhouse gas emissions 25 percent by 2020 and 80 percent by 2050

- Expand energy efficiency programs through targeted outreach and new financing mechanisms
- Increase local, renewable energy sources, including expanding district energy and cogeneration.
- Re-envision Boston's transportation system of the future to achieve dramatic greenhouse gas reductions from the transportation sector.

Prepare Boston for the impacts of climate change

- Work with regional agencies including the state and surrounding municipalities to align and accelerate regional preparedness planning.
- Incorporate climate preparedness into existing local planning and community engagement efforts.
- Ensure public and private sector developments and major capital projects are prepared for expected climate change over their projected life cycles.

Promote healthy and equitable communities

- Encourage sustainable development in Boston that creates opportunities for current and future residents.
- Ensure equitable access to green jobs and facilitate job training.
- Implement the Housing a Changing City and 2015-2021 Open Space plans
- Promote environmental justice in all policies and programs and reduce disproportionate negative environmental impacts.

Increase community engagement

- Support grassroots, community climate action efforts
- Incorporate sustainability into all aspects of education

Measure progress

- Track and publically report on the Climate Action Plan's progress year-over-year.
- Use performance measurement, targets and goals to motivate climate action and behavior change.

INTRODUCTION

STATE OF THE CLIMATE

In the past few years, several national and regional reports have continued to echo each other: our planet is warming, and evidence of the changing climate is mounting.

The changing climate has systematic impacts on our economy and infrastructure including agriculture, water, energy, and

transportation. The year 2012 was the second costliest year in U.S. history for natural disasters, amounting to \$110 billion. In the Northeast region, our aging infrastructure will be increasingly compromised by climate-related hazards. Many projections indicate that the average annual temperature in the Northeast will rise

between three and 10 degree Fahrenheit by the 2080s, as well as fewer but more intense and concentrated bursts of precipitation events. Boston, as a coastal city, is undoubtedly vulnerable and at high risk of damaging by climate impacts.

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Quick Facts:

Global Climate Change

- Global annual average temperature has increased more than 1.5 degree Fahrenheit since 1880.
- 2014 is on track to be the hottest year on record.
- Arctic sea ice extent has decreased by more than 40 percent since satellite record began in 1978.
- Global average sea-level was 1.5 inches above the 1993-2010 average in 2013, and will continue rising at a rate of 1/8 of an inch per year.
- By 2100, sea-level is projected to rise between three and six feet.
- Concentration of CO₂ has exceeded 400 parts per million.
- The year 2012 was a record-breaking year for extreme weather events—from drought in New Zealand, to flash floods in India, to Superstorm Sandy on the U.S. East Coast, or Super Typhoon Haiyan in the Philippines—impacts caused by the changing climate are felt by many communities around the world.

Impacts to Boston

- Boston has been ranked the eight most at risk coastal city in the world in terms of economic impact from projected flooding.
- Sea-level rise in Boston is likely to be greater than the global average because Boston's land is subsiding, or sinking, at about six inches per century.
- It is projected that by 2047, Boston's coldest years will be warmer than the warmest years Boston has experienced since 2005.
- In the past 24 months, Boston experienced four near-miss 100-year floods: Superstorm Sandy, Winter Storm Nemo, and two other Nor'easters.
- Boston's coastal neighborhoods and the majority of the Harbor Islands would flood if sea-level rises five feet—equivalent to Superstorm Sandy hitting Boston at high tide.
- If sea-level rises 7.5 feet, which could happen by the end of the century, more than half of Boston's 12 neighborhoods would be inundated during high tide.
- By the end of the century, Boston may experience up to 62 days over 90 degrees Fahrenheit, up from the current average of 10.

Placeholder: Carbon Cycle Graphic

ABOUT THE PLAN

Boston's greenhouse gas reduction goals of 25 percent by 2020 and 80 percent by 2050 below 2005 levels was recommended by the community and officially adopted by the City of Boston via *A Climate of Progress: City of Boston Climate Action Plan Update 2011*. The 2011 plan set forth that Boston shall incorporate climate projections into all formal planning and project review processes, engage all segments of the community in climate action, and develop innovative businesses and workforce skills to take advantage of climate action opportunities. This update builds on these goals with the following components:

1. A new, more rigorous greenhouse gas measuring and modeling methodology, with a first look towards Boston's 80 percent by 2050 carbon reduction goal.

2. More comprehensive climate preparedness strategies.
3. An emphasis on key cross-cutting themes including social equity, economic development, and public health and safety.
4. More extensive and inclusive community engagement process.
5. A new performance measurement system to measure year-over-year progress and keep us on track to meeting Boston's goals.

REDUCING GREENHOUSE GAS EMISSIONS
This plan outlines a robust and analytically rigorous strategy to reduce community-wide carbon emissions 25 percent by 2020. After taking into account future projections of both population and jobs, it is estimated that Boston must reduce emissions by almost 800,000 metric tons of CO₂e in

Sharing Best Practices

Boston is one of many cities across the world that is taking aggressive climate action to reduce carbon emissions and prepare for the impacts of climate change. Through a variety of national and international networks, Boston is sharing its lessons learned and learning from other cities around the world. Boston has long been a part of the **Urban Sustainability Directors Network (USDN)**, a member group of over 120 North American cities dedicated to promoting peer-to-peer sharing and learning, funding scaleable, innovative projects, and expanding access through regional networks.

More recently, Boston joined **C40 Cities Climate Leadership Group**, an invitation-only global network of cities on the front line of preparing for and helping prevent climate change. Cities are invited to join the C40 based on population size, economic output, and commitment and leadership in taking action on climate change. Boston's participation in the C40 will open up greater opportunities for sharing what the city has done and benefiting from insights and partnerships with cities in C40's global network.

order to reach our 2020 goal. The table on the next page outlines the key metrics and targets that the City will track.

In addition to focusing on Boston's 2020 carbon goals, this plan takes a pivotal step in starting to look towards the 2050 goals. The 80x50

chapter begins to think about how Boston could become a nearly carbon neutral city.

	2005	2013	2020	Percent Reduction	Progress: 2005-2013	Targets: 2014-2020
Large Buildings and Institutions (LBI)¹	4.04 Mmt ²	3.19	2.79	13 percent	<ol style="list-style-type: none"> 1. Commercial buildings have decreased energy use by 4.1 percent 2. Steam provides roughly 10 percent of LBI use 3. Installed 14.3 MW of solar citywide 	<ol style="list-style-type: none"> 1. Decrease energy use seven percent across all buildings reporting under the disclosure ordinance 2. Steam from co-generation should provide 15 percent of LBI energy use 3. Install 10 MW of commercial solar
Transportation	1.79	1.67	1.37	19 percent	<ol style="list-style-type: none"> 1. Reduced VMTs 1.7 percent per capita from 2010 to 2012 2. Residency rate³ was 39 percent in 2010 	<ol style="list-style-type: none"> 1. Increase fuel economy standard above federal standards 2. Reduce vehicle miles traveled by 5.5 percent below 2005 levels 3. Increase the percentage of Boston-based residents who also work in Boston (residency rate)
Neighborhoods	1.59	1.29	1.19	8 percent	<ol style="list-style-type: none"> 1. Completed 35,858 audits ('09 to '13 only) 2. Completed ~18,000 significant actions ('09 to '13 only) 	<ol style="list-style-type: none"> 1. Complete 72,000 home energy audits 2. Complete 36,000 home weatherizations, heating system replacements, or other significant upgrades
Total	7.43	6.35	5.35	13 percent⁴		

¹ Includes Boston Water and Sewer Commission data.

² Mmt = Million metric tons of CO₂e.

³ The percentage of Boston residents who also work in Boston.

⁴ Includes 2.5 percent contingency for a total target of 27.5 percent from 2005 baseline.

CLIMATE PREPAREDNESS

Climate change will continue to bring higher temperatures and sea levels, more frequent heat waves and floods, more intense storms, and many associated public health, infrastructure, and economic consequences to Boston. These effects are already being measured in Boston and around the world. Although we do not know exactly how great the changes in the environment will be—in part because we do not know how successful the global community will be in reducing greenhouse gas

emissions—the range of the effects is projected with increasing confidence. The magnitude of such changes are significant, with the likelihood of endangering human lives and health, damaging private property and essential public infrastructure, and threatening the social, environmental, and economic systems on which our community depends.

Making Boston climate-prepared will be a long-term endeavor. It will require immediate changes to

make sure that we are ready for the risks we face right now, and long-range changes to anticipate the bigger impacts at the end of the century. It will require small-scale changes—planting a tree, checking up on a neighbor—and large-scale changes that address, for example, the regional energy systems. It will require the participation of all levels of society and government—residents, small-business owners, major landowners, long-standing institutions, as well as local, state, and federal government.

Placeholder timeline for climate preparedness activities

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CROSS-CUTTING THEMES

SOCIAL EQUITY

Planning for climate change provides an opportunity to rethink our future around a set of more equitable principles and priorities. The strategies and actions in this plan strive to do more than reduce greenhouse gas emissions. They aim to make a healthy and sustainable lifestyle accessible to all Bostonians. This means creating jobs that pay a living wage and are obtainable to those who need them most. It means reducing the number of miles we drive, while ensuring equitable access to transit and mobility options. It means that healthy, local food is readily available and affordable in all neighborhoods. And it means that all residents and businesses large and small have the resources to be prepared for the impacts of climate change.

Climate action and social equity are intrinsically connected on many scales. Globally, developed nations are responsible for a majority of world's carbon emissions, yet it is developing countries and their populations that are often the most vulnerable. On the local level, climate change, if unaddressed, will also disproportionately affect our most vulnerable populations. Boston, along with many other cities around the world, has chosen to be a leader. With equity in mind, Boston is demonstrating that cities can flourish while transitioning off a carbon-based economy.

Boston has a lot at stake if global carbon emissions are not reduced. Not only is our increasingly valuable waterfront at risk, but the city is also home to a diverse population and responsible for vulnerable communities that might lack the

resources or means to respond to climate change. By reducing Boston's carbon footprint and preparing for climate change, we are beginning to take the necessary steps to ensure that all Bostonians, and hopefully all people, have a more optimistic future.

ECONOMIC DEVELOPMENT

Economic development in Boston is critical to achieving regional and state climate goals, and will help achieve the vision for a more equitable city. Climate action is also inherently local, and through, for example, energy efficiency, local, renewable energy installations, waste recovery, local agriculture and infrastructure improvement projects, will create jobs that cannot be exported overseas.

More development in Boston means more jobs and more people living

closer to one another, which is conducive for a low-carbon lifestyle. People who live and work in the city are more likely to take public transportation, bike, or walk. Homes and offices in the city also tend to be smaller, resulting in less energy use for heating and cooling.

Living in cities also better connects people to one another, benefiting us not only socially and culturally, but also enabling us to share resources. In a city, not everyone needs their own car, bike or even backyard. We share these things with our neighbors through systems like Hubway and our parks. Technology also makes sharing easier, expanding the possibilities for exchanging items such as tools, recreational equipment and small kitchen appliances with neighbors, friends and people we have yet to meet.

While much of Boston is relatively compact and transit-friendly, there

is still work to do. Boston will need to accommodate more growth because if we do not, it will sprawl to less compact and connected areas around the region.

We must also be thoughtful about how and where this growth happens to ensure it is sustainable, and achieves social equity objectives. As more people chose to live in Boston, we must make sure current residents are not being pushed out by rising property values or other means of gentrification. This Climate Action Plan seeks to ensure that all Bostonians, present and future, benefit from the economic development opportunities.

With the right training programs, all Bostonians can prosper from this economic development. Many actions identified by this plan focus on developing the skills and training to meet the needs of the growing green economy. We have already seen the benefits in the clean-tech

From Green Jobs to a Green Economy

According to the Massachusetts Clean Energy Center (MassCEC), clean energy jobs grew by 24 percent in 2012 and 2013 to almost 80,000 jobs in Massachusetts. Next Step Living, one of Boston's primary efficiency service vendors, grew to more than 700 employees in the past five years.

Boston Housing Authority's (BHA) energy efficiency contract will save over \$100 million in energy costs, and its Project Labor Agreement creating 600 jobs, of which 103 were BHA residents. Going forward, green principles should be embedded into the entire economy, creating demand for green services by raising City standards and public interest in how efficient our homes can be, what happens to our waste, and where our food comes from, while training workers with the necessary skills to meet this needs of a green economy.

and energy efficiency sectors. And this is just the tip of the iceberg. However, as we move towards implementation, we need to ensure that there is a clear path for current Bostonians who need the jobs the most to have access to them.

COMMUNITY ENGAGEMENT

In 2010, Boston's Climate Action Leadership Committee and Community Advisory Committee made clear that community engagement is a critical component of Boston's climate action plan. Their summary report, *Sparking Boston's Climate Revolution*, stated, "Because the costs of inaction are high, because Boston has ambitious goals, effective climate action requires the help of every Bostonian." With this in mind, the City of Boston set out to involve the community from the onset of the 2014 Climate Action Plan Update process so that all Bostonians will have ownership of

the plan and be empowered to implement it.

- Over 700 people provided comments and feedback via the Greenovate Boston online engagement platform, Engage.GreenovateBoston.org
- Various community groups hosted community meet-ups to discuss aspects of the plan that were important to them. In total, approximately 300 people participated in these events.
- Over 500 people attended Greenovate Boston's first community summit, held in May 2014, which provided further opportunity to provide feedback.

In addition to this grassroots-driven engagement, the CAP Update process also included a Steering Committee, appointed by Mayor Martin J. Walsh to advise the City throughout the process. The Steering Committee included community members representing a variety of

sectors from businesses, to community organizations, to research institutions.

The Steering Committee met three times throughout the planning process, and they were joined by a group of core City officials. The Steering Committee also included four strategy subcommittees: Neighborhoods, Large Buildings and Institutions, Climate Preparedness and 80x50. The Large Buildings and Institutions subcommittee coincided with the Green Ribbon Commission's Commercial and Industrial working group. No transportation subcommittee was formed because there will be a separate Go Boston 2030 mobility planning process.

Community engagement will remain a priority as we move towards implementation. The Green Ribbon Commission will continue to lead stakeholder engagement in the commercial sector for both

climate preparedness and carbon reductions. In addition, the Neighborhoods subcommittee, led by Greenovate Boston is meeting regularly to work on implementing climate action in the community.

The Green Ribbon Commission

The Boston Green Ribbon Commission, co-chaired by Mayor Walsh, is a group of business, institutional and civic leaders in Boston working to develop shared strategies for fighting climate change in coordination with the city's Climate Action Plan. Many cities have produced similar plans. But few have also enlisted the support and leadership of the local business community as effectively as Boston. With five working groups – Commercial Real Estate, Health Care, Higher Education, Climate Preparedness, and Transportation – the Green Ribbon Commission is a platform for Boston's institutional and business leaders to prepare the city for climate change while reducing our greenhouse gases.

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2014 Climate Action Plan Steering Committee Members

Vivien Li, Co-Chair	The Boston Harbor Association, President
Andrew Kendall	Henry P. Kendall Foundation, Executive Director
Anthony Janetos	The Frederick S. Pardee Center for the Study of the Longer-Range Future, Director
Brian Doherty	Building and Construction Trades Council
Bud Ris	Former New England Aquarium, President and CEO
Christine Poff	Boston Parks Advocates, Lead Organizer; Franklin Park Coalition, Executive Director
Crystal Johnson	ISES - Integrative Sustainability and Environmental Solutions, Energy & Sustainability Strategist
Cynthia Loesch	Codman Square Neighborhood Council, Vice President
Edward Glaeser	Harvard University, Eleanor Glimp Professor of Economics in the Faculty of Arts and Sciences; Taubman Center for State and Local Government, Director; Rappaport Institute of Greater Boston, Director
Jacqueline Douglas	Livable Streets Alliance, Executive Director
Jhana Senxian	Sustainability Guild International, CEO
Kelly Saito	Gerding Edlen, President
Magdalena Ayer	Maverick Association of Residents
Marilyn Swartz-Lloyd	MASCO, President and CEO
Mark Liu	Chinese Progressive Association, Deputy Director
Nancy Kilburn	Greater Boston Interfaith Organization; Roxbury Presbyterian Church Social Impact Center, Director
Penn Loh	Tufts University Masters of Public Policy Program and Community Practice, Director
Rick Dimino	A Better City, President and CEO
Robbin Peach	MassPort, Program Manager for Resilience
Rosanne Foley	Fields Corner Main Street, Director
Stephanie Pollack	Northeastern University, Dukakis Center for Urban and Regional Policy, Associate Director
David Brewster	EnerNOC, Inc, President
Tom McShane	Dewey Square Group, Principal; Boston Harbor Island Alliance, Director
City of Boston Representatives	
Brian Swett, Co-Chair	Chief of Environment, Energy and Open Space
Councilor Matt O'Malley	Boston City Council, Environment and Parks Committee Chair
John Barros	Chief of Economic Development
Sheila Dillon	Chief of Housing
Felix Arroyo	Chief of Health and Human Services
James Gillooly	Boston Transportation Department, Interim Commissioner
Barbara Ferrer	Boston Public Health Commission, Director
Michael Dennehy	Public Works Department, Interim Commissioner

MEASURING PROGRESS

Timely and accurate measurement of Boston's carbon footprint gives us knowledge on the success of our strategies and will help us make adjustments if they are falling short of the city's carbon goals.

Better measurement will always be a work in progress. Quality data is often challenging to obtain. Boston has two different electric and gas utilities, a steam operator, a decentralized oil network, and hundreds of thousands of individual vehicles. However, the City has made significant progress on performance measurement since the 2011 Climate Action Plan. For example, the passage of the

Building Energy Reporting and Disclosure Ordinance will yield building-level data on most of the large buildings in the city. In addition, transportation emissions are now based on annual vehicle miles traveled data, as opposed to modeled ten-year estimates.

The performance measurement system incorporates our carbon emissions, strategies and actions. Our carbon emissions, or carbon footprint, are Boston's raw consumption of fossil fuels and is the "bottom line" for reducing greenhouse gas emissions. Because weather and other year-to-year variations can have a significant

effect on energy use, the new performance measurement system will also track the actions being taken by our residents, businesses, and community organizations through City and City-affiliated programs. The website will include a "green map" with zip code level data to track and motivate climate action on the neighborhood level.

Going forward, Boston will publically report on the Climate Action Plan's progress each year through the Greenovate Boston website.

Carbon Emissions Sources

1. Gas and electricity consumption per account
2. Electricity and steam carbon intensity (carbon emissions factor)
3. Vehicle miles traveled and fuel economy
4. Oil and steam consumption (based on statewide data)

STRATEGIES



Key Actions

1. Number of retrofits by residential (e.g. audits and weatherizations) and commercial entities; number of LBI entities enrolled in energy efficiency and peer learning programs
2. Co-generation and renewable growth in the City
3. Percentage of Bostonians driving alone to work, biking, and taking transit; number of Boston workers also living in Boston (from Census)
4. Number of upgrades to co-generation steam and low-carbon heating sources

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BOSTON'S CARBON FOOTPRINT

Boston has been measuring its carbon footprint annually since 2005. This is done by measuring the amount of carbon dioxide and other greenhouse gases emitted due to the consumption of fossil fuels by all buildings, homes and infrastructure in Boston.

CARBON SOURCES

The primary sources of carbon emissions measured by our greenhouse gas inventory include electricity, heating fuels (natural gas, and oil), and transportation (gasoline and diesel).

MAKING PROGRESS

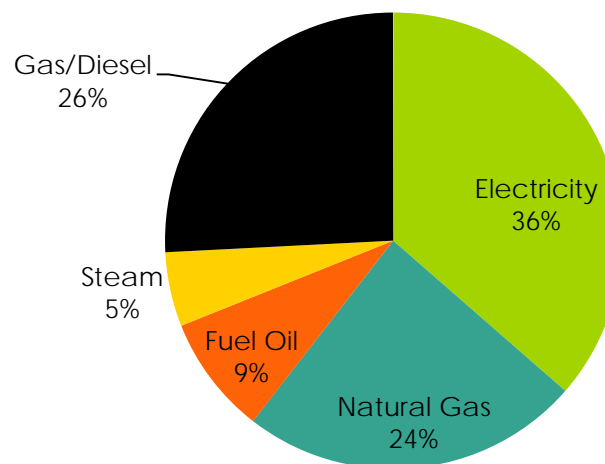
As of 2013, Boston's carbon emissions have declined by approximately 15.5 percent below 2005 levels. Most of this reduction (42 percent) has been from fuel switching at the power plants that feed our electricity grid. Over the past ten years, coal and oil has

been replaced by natural gas, which is increasingly more economical and lower carbon. Other major drivers of our carbon reduction include a decrease in emissions from heating oil (both from phasing out oil as well as increases in energy efficiency), a decrease in the steam emissions factor (more steam energy is being generated by

What is CO₂e?

CO₂e, or carbon dioxide equivalent, is a standard unit for measuring carbon footprints. The idea is to express the impact of each different greenhouse gas in terms of the amount of CO₂ that would create the same amount of warming.

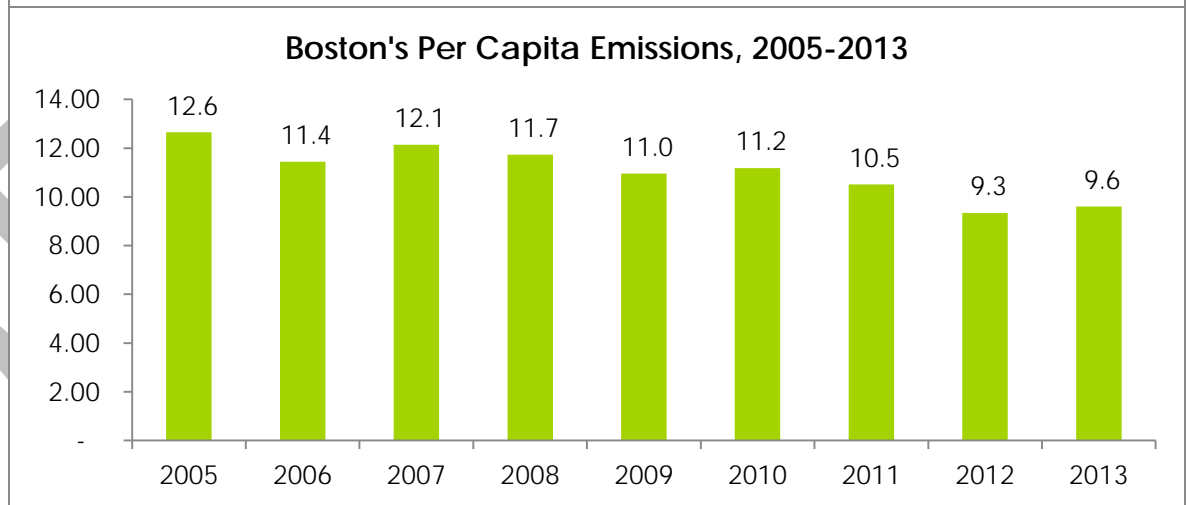
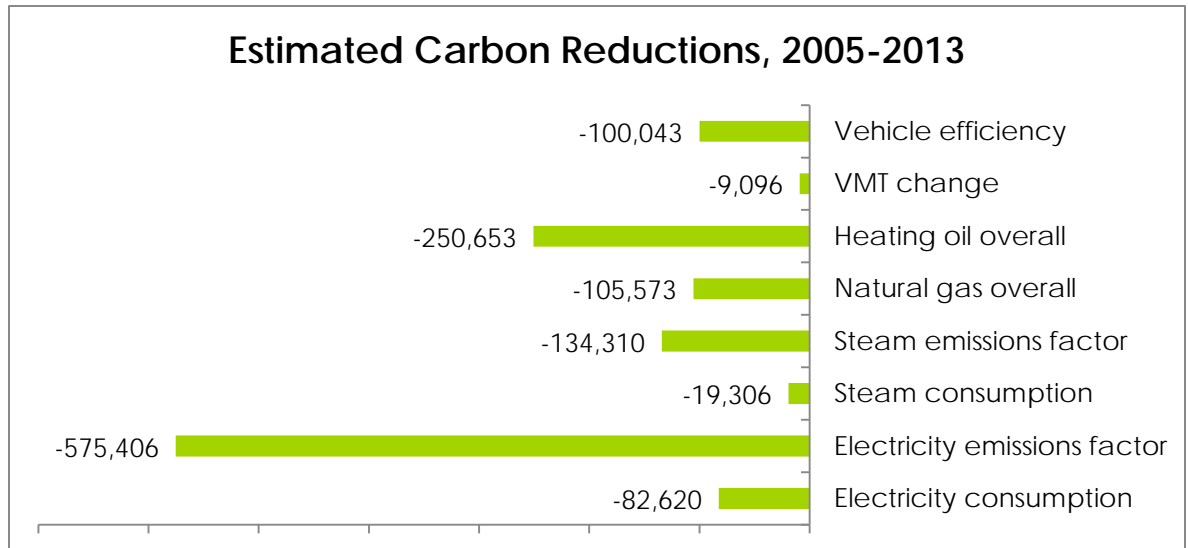
Boston's Greenhouse Gas Emissions by Source, 2013



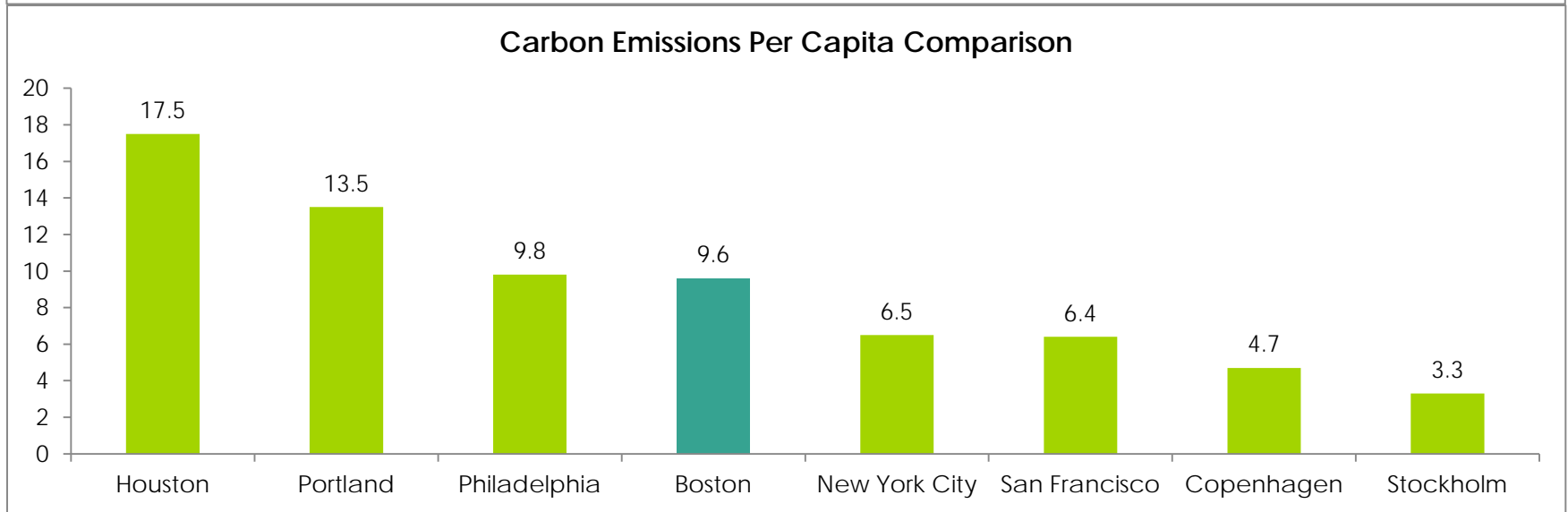
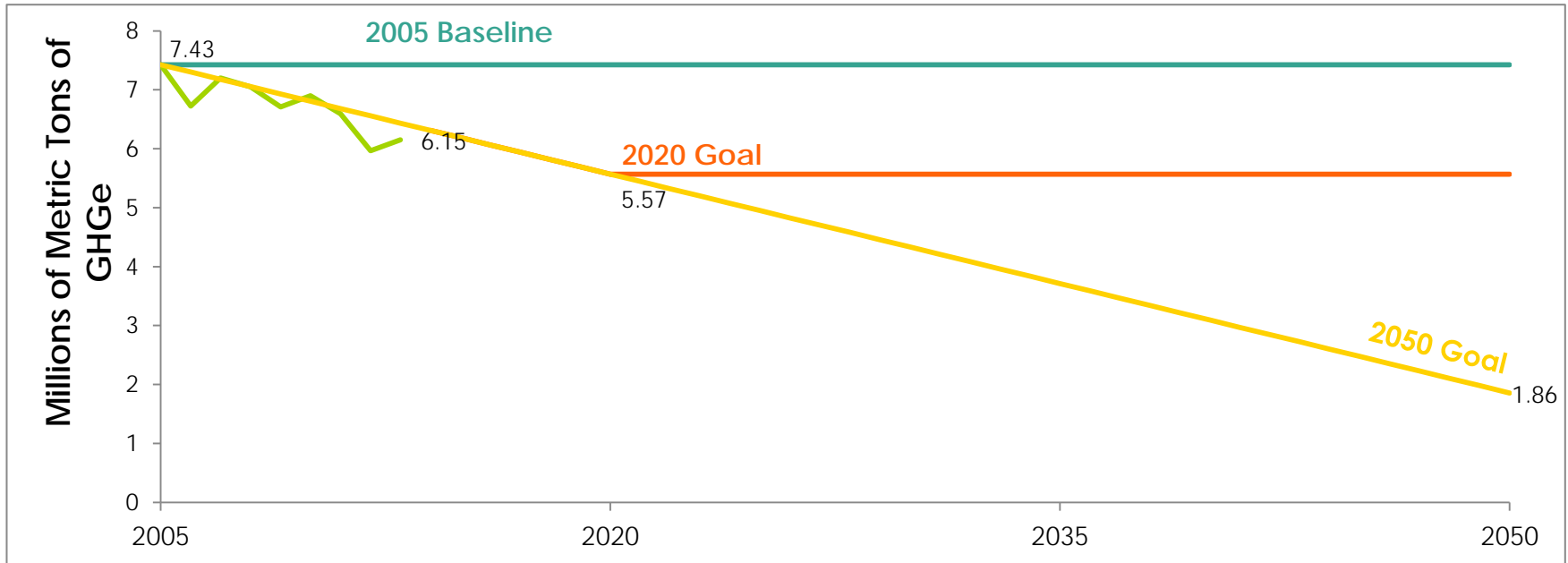
natural gas, versus oil), a decrease in natural gas consumption, and from Bostonians driving more fuel-efficient vehicles.

Boston's carbon reduction has outpaced the city's growing population and jobs. Growth alone would have led to an increase in carbon emissions by approximately seven percent. However efforts to reduce our energy use and carbon footprint have more than accommodated this growth. As a result, emissions per person in Boston have decreased from 12.7 CO₂e per person in 2005 to 9.6 in 2013.

Among U.S. cities, Boston has one of the lowest emissions per capita. New York City has lower per capita emissions at 6.4, largely due to its denser population and high public transportation use. Looking towards European cities such as Copenhagen and Stockholm, we can see that even further reductions in per capita emissions are possible.



These cities have per capita promote an exceptionally high emissions of 4.7 and 3.3, respectively. standard of living. These cities prove that low-carbon cities are possible and can even



Source: PlaNYC Inventory of New York City Greenhouse Gas Emissions, December 2012
http://s-media.nyc.gov/agencies/planyc2030/pdf/greenhousegas_2012.pdf

ACCOMPLISHMENTS SINCE 2011

Add updated table from 2011 CAP

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NEIGHBORHOODS

Boston's strength, diversity and vitality are rooted in its neighborhoods. They are home to our residents and small businesses, triple-deckers and brownstones, schools and parks, and community gardens and bodegas. While Boston's neighborhoods only account for approximately 20 percent of the city's greenhouse gas emissions, they are where climate action and sustainability come to life. The championing of climate action at the neighborhood level will be crucial for the City to adopt smart policies and programs that prepare the City for climate

change and drive further reductions across all sectors. In this sense, the success of the entire Climate Action Plan depends on the neighborhoods.

Looking forward, the neighborhood sector has a target to reduce its greenhouse gas emissions by 7.5 percent, or approximately 100,000 metric tons. This reduction will require an acceleration of existing energy efficiency and renewable energy programs. Boston will need a 50 percent increase in the number of annual home energy audits and more substantive energy efficiency

projects like weatherizations and heating systems. But while energy efficiency and renewable energy have the most direct bearing on greenhouse gas emissions, all residents must become engaged with climate action and sustainability. This chapter not only outlines strategies for energy efficiency and renewables, but also strategies to bring climate action to the neighborhoods through green space and trees, recycling and composting, and urban food systems.

2020 GOALS AND TARGETS

	2013 (CO ₂ e)	2020 Goal (CO ₂ e)	Percent of 2020 GHG Goal
Neighborhoods	1.29 million metric tons	1.19 million metric tons	7 percent
Targets			
<ul style="list-style-type: none"> • Complete 72,000 home energy audits • Complete 36,000 home weatherizations, heating system replacements, or other significant upgrades 			

STRATEGIES AND ACTIONS

1. COMMUNITY ENGAGEMENT

1.1 EMPOWER RESIDENTS AND BUSINESSES TO TAKE CLIMATE ACTION IN THEIR NEIGHBORHOODS

In order to reach Boston's climate goals, every resident and business must help implement the Climate Action Plan. That is why, in 2013, the City launched Greenovate Boston, the city's overarching sustainability initiative to help drive and support climate action throughout Boston's neighborhoods. Many residents and businesses are already taking action; Greenovate Boston serves as a resource to support them, as well as a platform to encourage further action and help connect grassroots action to Boston's citywide goals and strategies.

Actions	Description
1.11 Create a neighborhood climate action network	To support this network, Greenovate Boston should facilitate open meetings that connect the City of Boston to community members and vice versa.
1.12 Pilot neighborhood-level sustainability planning	Greenovate Boston should provide a framework for individuals and communities to set goals, complete projects and take climate action in their neighborhoods.
1.13 Create a one-stop-shop for sustainability resources	Greenovate Boston should work across City departments to develop guides and resources that connect Bostonians with information and tips for local sustainability.
1.14 Expand messaging and communications	Deliver messaging using a diverse set of channels and existing networks including: all City touch-points with the public, local weekly and foreign language newspapers, special events, and communities of faith and houses of worship.
1.15 Create a performance measurement system	Create a comprehensive and communicable performance measurement system to track overall progress towards climate goals, increase transparency and accountability, and provide neighborhood level data.

1.2 EMPOWER AND EDUCATE YOUTH AND YOUTH-SERVING ADULTS TO CREATE TANGIBLE PROJECTS IN THEIR COMMUNITIES

Bostonians should be engaged in climate action at a young age in order to establish the necessary habits and behaviors, as well as cultivate the leadership that we need to reach citywide carbon reduction goals. Our education system provides an opportunity to reach Boston youth, as well as influence parents and families. Green teams and sustainability coordinators in every school will not only help promote sustainable behaviors among staff and students, but they will also help develop leadership and job training skills among Boston's youth to help prepare them for their careers.

Actions	Description
1.21 Establish green teams and sustainability champions at every school	BPS principals shall designate a sustainability coordinator at each school to lead student green teams.
1.22 Incorporate sustainability into curriculums	Sustainability should be a common theme in the curriculum and programming of Boston Public Schools, Boston Center for Youth and Families, the Boston Youth Council, and other existing youth organizations and programs.

2. BUILDINGS AND ENERGY

2.1 EXPAND AND ACCELERATE ENERGY EFFICIENCY AND RENEWABLE ENERGY PROGRAMS AND UPTAKE.

More so than any other strategy, energy efficiency promoted through Renew Boston, the City's energy efficiency program, and other incentives and services offered by Boston's utility partners, will be critical to meeting Boston's near-term greenhouse gas reduction goals. To reach these goals, participation in existing programs such as audits and weatherizations for 1-4 unit homes, small business direct install, and bulk solar purchasing, must be accelerated. In addition, new programs and marketing must be developed to reach new audiences. Such programs may include additional technologies and incentives that start with enhancing renter participation, targeting low-income and foreign-language populations, encourage a shift away from oil and electric-resistance heating systems, and marketing programs for five-unit and above buildings.

Actions	Description
2.11 Expand energy efficiency programs for new participants	Create energy efficiency programs that enhance renter, low-income, and multi-family experiences and uptake in energy efficiency.
2.12 Accelerate residential solar	Continue to accelerate solar deployment by continuing Solarize program and tackling existing barriers in the multi-family and renter market.
2.13 Support small businesses going green	Introduce a turnkey matchmaking service for small businesses that allows them to be paired with sustainability services.
2.14 Accelerate uptake and expand the scope of energy audits	Explore introducing an energy audit at the home point-of-sale or through the building permitting process, while making the audit an entry-point into all available efficiency products and services.
2.15 Introduce new technology	Deploy residential technologies that start with enabling renters to participate in energy efficiency, such as Wi-Fi-enabled "smart" thermostats, while piloting new business models that tackle tenant-landlord split issues.
2.16 Expand the Whole Building Incentive	Scale up and build on the Whole Building Incentive to encourage higher incentives for weatherizations that occur over the entire building, as well as better coordination among the landlord and building tenants.
2.17 Promote programs in multiple languages	Enhance translation abilities of home performance contractors so that energy efficiency is accessible by all populations in Boston.
2.18 Transition from high carbon heating sources	Work with the Commonwealth to shift residential units and small businesses away from inefficient and carbon-intensive heating systems, including electrical resistance heat, oil heat, and inefficient natural gas heat.

3. WASTE AND CONSUMPTION

3.1 MAKE PROGRESS TOWARDS A WASTE- AND LITTER-FREE CITY

Boston's residential waste currently goes to a waste-to-energy facility, which provides energy to power our electricity grid. The carbon emissions from that facility are included in the emissions factor used to calculate Boston's total carbon emissions. That is why this year, to avoid double counting, waste emissions data was removed from our inventory. However, the City of Boston, and many in the community are still committed to reducing waste by increasing recycling and reuse, and diverting organics. By keeping these valuables out of our waste stream, we can collectively save money, create local jobs, and improve our environment.

Actions	Description
3.11 Launch a zero waste planning process	The City should start a comprehensive zero waste planning process.
3.12 Increase recycling in public places	The Department of Public Works, Parks Department and property management should work to expand recycling in public places.
3.13 Expand composting in Boston Public Schools	Boston Public Schools should pilot a composting program.

3.2 EXPAND ACCESS TO HEALTHY AND LOCAL FOOD

Access to healthy, local food emerged as a clear community priority through the 2014 Transition report, the Greenovate Boston Community Summit, and other Greenovate Boston Meet-ups. By participating in urban farming, whether by growing food to sell; or, by purchasing fresh products from a local farmer; or, by growing your own food in a community plot or backyard, people can contribute to positive environmental, economic and social impacts. Climate change is predicted to have a profound impact on our global food system; therefore a robust local food system is a critical component of climate adaptation planning.

Actions	Description
3.21 Transform vacant lots into urban farms or community garden plots	The Department of Neighborhood Development should continue to explore the transformation of vacant lots into urban agriculture or community garden plots.
3.22 Increase healthy food education	The Office of Food Initiatives should expand programs to educate residents about healthy food options, in particular simple and easy ways to prepare and serve healthy foods.
3.23 Increase funding of Boston Bounty Bucks	Boston Bounty Bucks, which is currently funded by the Mayor's Fresh Food Fund, should be increased in order to keep up with demand.
3.24 Expand the Healthy Corner Store Initiative	Expand BPHC's Healthy Corner Store Initiative to additional neighborhoods and increase citywide participation.
3.25 Complete a city-wide food resilience study	With funding from the Kendall Foundation, the City has recently commissioned a team to complete a city-wide food resilience study.
3.26 Increase access to local healthy food in Boston Public Schools	Expand Boston Public School's Farm to School program and increase on-site production to engage students.

Cross-Cutting Theme: Equitable Food Access in Dudley Square

A decade ago, a third of the land near Dudley Square lay vacant. Today, tens of community gardens and a 10,000 square foot greenhouse, staffed by over 100 youth volunteers, grows local, healthy food for the neighborhood. Work pioneered by The Food Project, City Fresh Foods, City Growers, Dudley Street Neighborhood Initiative, and many others allowed for healthy, affordable, local food to serve Roxbury and Dorchester, traditionally underserved neighborhoods that have a >70% minority population. Food production is only the start – existing or future plans for local processing, retail sales, and waste processing related to these gardens close the loop, creating jobs, making communities healthier, and strengthening community bonds. To further this vision, the City of Boston has begun a food resilience study to understand the opportunities and challenges in the regional food system. In the long-term, creating strong, resilient communities across all neighborhoods will better prepare Boston for climate change.

4. TREES AND OPEN SPACE

Trees and open space are an important part of any climate action plan—not only do they help clean our air, but they reduce the urban heat island affect and absorb flood waters. Trees and open space are also exceedingly recognized for their public health benefits from improved air quality to creating peaceful places for Bostonians to recharge. Boston has long been recognized for its historic park system, however maintaining Boston's parks and helping our urban forest flourish will take the support and collaboration of the public and private sector.

Actions	Description
4.11 Create a tree canopy plan	Create a clear, actionable tree canopy plan to reach target of 35 percent tree canopy coverage by 2030.
4.12 Create an open space plan	Create a 2015-2021 open space plan for maintaining and enhancing Boston's green spaces.

DRAFT

LARGE BUILDINGS AND INSTITUTIONS

Boston is home to thousands of large buildings, including commercial buildings, industrial facilities, university and hospitals campuses, cultural institutions, and civic facilities. Together, this sector of large buildings and institutions (LBI) contributes to approximately 50

percent of Boston's greenhouse gas emissions. As a result, climate action from the LBI sector will play a crucial role in achieving a 25 percent reduction in carbon emissions by 2020. This sector represent a large percentage of Boston's total building square footage and

carbon emissions, concentrated in a relatively small number of buildings. As a result, the LBI sector presents an opportunity to achieve significant emissions reduction by engaging a relatively focused set of businesses and institutions.

2020 GOALS AND TARGETS

	2013 (CO ₂ e)	2020 Goal (CO ₂ e)	Percent of 2020 GHG Goal
Large Buildings & Institutions	3.19 million metric tons	2.79 million metric tons	14 percent
Targets <ul style="list-style-type: none"> • Reduce energy consumption seven percent across all BERDO buildings <ul style="list-style-type: none"> ○ 60 M SF => reduce energy by five percent from 2014 ○ 40 M SF => reduce energy by 12.5 percent from 2014 ○ 20 M SF => reduce energy by 25 percent from 2014 • Fuels: Ten percent of city's energy use from co-generation <ul style="list-style-type: none"> ○ Ten MW of commercial solar 			

STRATEGIES AND ACTIONS

1. BUILDINGS AND ENERGY

1.1 MAINTAIN AND EXPAND ENERGY EFFICIENCY PROGRAMS

Energy-efficiency programs in Boston are coordinated by Renew Boston, a partnership between the City, energy utilities, and service providers. Through a multi-stakeholder process, this program should be expanded with new incentives in order to connect more buildings into energy efficiency programs. Buildings in the LBI sector will in turn benefit from targeted outreach, better connections to utility programs, new financing mechanisms, and new incentives for equipment replacement and efficiency in commercial tenant space.

Leading by Example: Mayor's Carbon Cup

On May 31, 2014, Mayor Martin J. Walsh showcased four large institutions that have joined the Mayor's Carbon Cup by each committing at least one million square feet of building space to a 35 percent reduction in greenhouse gas emissions intensity by 2020. These institutions collectively committed roughly 15 million square feet to the Cup and, if successful, will remove over 75,000 metric tons of CO₂e from a 2005 baseline, equivalent to weatherizing close to 60,000 housing units. The Cup continues to seeking new commercial real estate, hospitals, and universities to join the Cup.

Action	Description
1.11 Expand engagement for targeted efficiency	Engage third-party organizations to target opportunities for energy efficiency in LBI buildings, and communicate to utilities when permits are issued for building renovations.
1.12 Support financing for energy efficiency	Assess and address LBI energy efficiency financing needs, and, at the state level, support on-bill utility financing and C-PACE programs.
1.13 Facilitate equipment upgrades	Work with utilities to incentivize replacement of inefficient equipment before end-of-life, and facilitate the bulk purchasing of efficient equipment.
1.14 Develop tenant fit-out incentives	Work with utilities to identify efficiency incentives for the fit-out of commercial tenant space.
1.15 Develop oil heat efficiency program	Work with the Commonwealth to develop a program for replacing oil heat systems, including, for example, a fuel oil surcharge to provide funding.

1.2 ENGAGE AND FACILITATE VOLUNTARY ENERGY EFFICIENCY ACTION

The City will encourage deep carbon reductions and conducting targeted outreach to building stakeholders. In particular, efficiency in tenant spaces is an important area of focus. In addition, the City will help facilitate learning within sectors, so that successful examples can be communicated to peer organizations.

Action	Description
1.21 Expand recognition of deep reductions	Use programs like the Mayor's Carbon Cup to recognize organizations that achieve deep GHG reduction goals, including those that adopt Boston's climate goals as their own.
1.22 Engage tenant efficiency	Encourage and recognize efficiency in tenant spaces.
1.23 Expand engagement for voluntary efficiency actions	Encourage energy-efficient actions, such as purchasing high-efficiency equipment and nightly lighting shut-off.
1.24 Facilitate peer-to-peer learning	Enable institutions within each sector to learn about successful efficiency work, through pilots, workshops, and case studies.
1.25 Identify incentives for load shifting	Work with utilities to develop incentives for thermal and battery storage, to shift peak-hour demand.
1.26 Conduct audit outreach	Work with LBI organizations to encourage their staff and students to do home energy audits.
1.27 Lead by example on carbon reduction	Explore raising the 2020 municipal GHG reduction goal, and accelerate installation of efficient street lighting and building energy efficiency projects.

1.3 PILOT HIGH PERFORMANCE BUILDINGS

Over the past few years, the City has helped pilot net-zero homes, meaning homes that generate as much energy as they use. Looking ahead, the Commonwealth has established a vision of having all new buildings be net-zero in 2030. To lead these efforts, Boston will work to pilot net-zero commercial buildings. In addition, the City will explore establishing climate model districts where new buildings will be required or incentivized to meet advanced energy and preparedness standards.

Action	Description
1.31 Pilot net-zero buildings	Utilize incentives, vacant City land, and current programs for pilots of net-zero buildings across different sectors.
1.32 Explore climate model districts	Examine the potential for districts with comprehensive high performance and preparedness requirements for new buildings.

1.4 FACILITATE INNOVATION IN ENERGY EFFICIENCY

Faculty at the region's many architecture and engineering schools, as well as clean-tech research and development institutions, can play an important role in researching new building technologies. In addition, the City will bring stakeholders together to test new approaches to green leasing, in which both the landlord and tenant benefit from an energy-efficient building. Finally, the City will also identify incentives for the deployment of cool roof technologies.

Action	Description
1.41 Pilot new building technologies	Work with utilities to incentivize pilots of building technologies, and engage with Boston-area institutions on research.
1.42 Explore green leasing	Work with LBI stakeholders to examine innovative green leasing strategies.
1.43 Identify incentives for cool roofs	Incentivize cool roofs on new buildings and green roof retrofits in order to mitigate urban heat islands.

1.5 IMPLEMENT ENERGY CODES AND REPORTING REQUIREMENTS FOR EXISTING BUILDINGS

The Commonwealth is responsible for developing building energy codes, including the stretch code, which is a more advanced alternative that Boston has adopted. Boston needs to ensure that current codes are well-enforced, and that the next stretch code will encompass renovation and tenant fit-out, both of which would be key to improving the efficiency of existing buildings. The City also continues to implement the Building Energy Reporting and Disclosure Ordinance, and, by 2019, many buildings covered by the ordinance will be required to either conduct an energy assessment or conduct building energy efficiency actions. The results of these five years can help inform the need for additional retrofit programs or requirements.

Action	Description
1.51 Ensure implementation of energy codes	Improve enforcement of current codes through training of inspectors.
1.52 Work with the Commonwealth on the new stretch code	Ensure that stretch code includes standards for building renovation and tenant fit-out.
1.53 Connect energy reporting into efficiency programs	Continue to implement the Building Energy Reporting and Disclosure Ordinance, and connect reporting buildings with Renew Boston and other efficiency programs.
1.54 Evaluate utility of potential retrofit ordinance after 2019	Study results of first five years of BERDO-required assessments and actions to evaluate if a retrofit ordinance would be useful.
1.55 Retrofit municipal buildings	Implement all cost-effective energy efficiency measures in municipal building projects.

1.6 INCREASE REQUIREMENTS FOR NEW BUILDINGS

Boston's new buildings will need to use significantly less energy in order for the city to achieve emissions reduction goals. In addition to pilots of high-performance and net-zero buildings, building requirements need to set a higher standard for energy performance. This will include LEED requirements, potential performance-based requirements that are oriented towards net-zero, and solar-readiness standards. As transportation is a major component of the city's emissions, Boston's new buildings will also need to foster sustainable transportation choices for workers and residents.

Action	Description
1.61 Study expansion of Article 37 LEED requirements	Examine lowering size threshold for LEED requirement, raising LEED standard to Silver, or both.
1.62 Evaluate performance-based standards for net-zero goals	Explore the role of energy-use intensity standards, with goal of net-zero new buildings by 2030.
1.63 Require new buildings to be solar-ready	Develop specific standards requiring that new buildings can accommodate solar installation, with flexibility for site suitability.
1.64 Explore increased municipal LEED requirements	Explore requiring new municipal buildings to achieve LEED Gold.
1.65 Require new large buildings to facilitate low-carbon transportation choices	Develop requirements for new buildings to foster biking, transit, walking, and car sharing options for workers.

1.7 EXPAND ONSITE RENEWABLE ENERGY, DISTRICT ENERGY AND COMBINED HEAT AND POWER

In addition to becoming more energy efficient, Boston's buildings must transition to renewable energy and eliminate on-site combustion of oil. To address this, the City will promote and lead by example with the installation of on-site renewable energy and CHP systems that provide combined on-site heat and electricity generation. In addition, many large buildings in Boston are connected to a district energy system, providing efficient, centralized heating and cooling. Expansion of these networks and the creation of new district energy systems can provide a significant improvement in energy efficiency and carbon emissions.

Action	Description
1.71 Address grid issues	Work with utilities and state to address problems of interconnecting renewables into the grid, focusing on downtown grid.
1.72 Promote on-site combined heat and power and renewables	Encourage commercial CHP, solar, and ground-source heat pumps.
1.73 Facilitate expansion of district energy	Expand district heating, cooling, and microgrids, through district-level planning and a potential requirement for new large buildings to study costs and benefits of connection.
1.74 Expand municipal installation of renewables, CHP, and district energy connections	Evaluate feasibility for all municipal buildings, and install solar where possible.

1.8 MOVE TO CLEANER, LOW-CARBON FUEL SOURCES

Carbon emissions from buildings depend on the types of fuels being used. In recent years, many LBI buildings and district steam providers have switched from fuel oil to cheaper, lower-carbon natural gas. To preserve the benefits of this fuel-switching, the City will work with state and utility partners to eliminate gas leaks and prevent spikes in the price of natural gas. Natural gas, however, remains a temporary 'bridge' towards long-term carbon neutrality, and the City will work on increasing the supply and purchasing of renewable energy, leading by example with its municipal buildings. An examination of carbon fees in other cities will also help inform the City's long-term strategy for moving towards carbon neutrality.

Action	Description
1.81 Support regional transition to low-carbon fuels	Work with the Commonwealth to develop a low-carbon fuel standard and increase the supply of carbon-free energy in the region.
1.82 Promote green power purchasing	Promote renewable energy purchasing, including buildings that have linked off-site renewable projects.
1.83 Study solutions to prevent natural gas spikes	Support technical or regulatory solutions, to preserve the fuel-switching that has happened.
1.84 Work to expedite gas leak repair	Work with utilities and the state to expedite the replacement of leak-prone pipes.
1.85 Increase municipal green power purchases	Expand renewable energy purchasing and use of electricity and renewable fuels for the municipal vehicle fleet.
1.86 Study policies on carbon fees in other cities	Evaluate the potential for a municipal or regional carbon tax or fee.

2. WASTE AND CONSUMPTION

2.1 EXPAND ORGANIC WASTE DIVERSION

According to the Massachusetts Department of Environmental Protection, food materials and organics make up 25 percent of the current waste stream. Organic waste collection and composting has been piloted through farmer's markets and at events in Boston. The state has also implemented a new commercial food waste ban. Boston should build on these efforts to bring composting and other means of organic waste diversion to all large buildings and institutions.

Leading by Example: Commercial Food Waste Ban

On October 1, 2014, the statewide commercial food waste disposal ban regulations went into effect. The ban, regulated by the Massachusetts Department of Environmental Protection (MassDEP), will require any entity that disposes of at least one ton of organic material per week to donate or re-purpose the useable food. Any remaining food waste will be shipped to an anaerobic digestion (AD) facility, where it will be converted to clean energy, or sent to composting and animal-feed operations.

Action	Description
2.11 Develop organics diversion program	Establish organic diversion programs for residential and commercial buildings.
2.12 Explore requiring new buildings to provide organic waste separation	Explore requiring large new buildings to provide facilities for disposing organics.
2.13 Expand municipal composting	Provide composting at schools; compost organic waste from Parks Department.

2.2 EXPAND COMMERCIAL RECYCLING

Increasing commercial recycling can reduce carbon emissions, engage citizens in an easy sustainability action, and help raise environmental consciousness. While all commercial recycling is overseen and regulated by the Commonwealth, the City can work with the state to create and implement new policies and programs. The City can also play a more direct role with respect to large residential, municipal buildings and public spaces.

Action	Description
2.21 Explore requirements for recycling and organic waste collection	Examine requirements for residential buildings, commercial buildings, and public events.
2.22 Promote recycling at LBI facilities	Conduct outreach in partnership with businesses, tenants, universities, and the MBTA.
2.23 Ensure all municipal buildings provide recycling	Provide recycling in schools, City buildings, public housing, and public spaces.
2.24 Examine requirements for recycling construction waste	Potentially require all waste to be recycled or salvaged at large construction sites.

2.3 PRODUCER RESPONSIBILITY

The City is a major purchaser of various equipment and supplies. To lead by example, the City will update its purchasing policies to expand the use of sustainable options.

Action	Description
2.31 Expand municipal green purchasing	Update the City's green purchasing policy.

DRAFT

TRANSPORTATION

From the country's first electric streetcar, to the Big Dig, to the launch of Hubway, Boston's transportation system continues to balance its historic landscape and the need to adapt and evolve to the changing times. Today we face new challenges. Boston is rapidly growing, and our transportation system must accommodate this growth in a way that drives down carbon emissions and helps us prepare for the impacts of climate change.

In order to address these challenges, the City launched the two-year Go Boston 2030 mobility visioning process, to be completed in 2016. Boston must ensure that our transportation system is not only able to handle continued growth, but that it also proactively upholds three priorities for the city: social equity, economic development,

and climate mitigation and preparedness.

Boston's Climate Action Plan will continue to inform our transportation decision making through Go Boston 2030. Unlike other chapters of this Climate Action Plan, the transportation section will provide only high-level targets that will inform Go Boston 2030, which will develop specific strategies over the next year. These strategies and implementation details will be reflected in the web version of the Climate Action Plan, which will be continuously updated.

The sections below describe four focus areas for climate, on which Go Boston 2030 will elaborate: vehicle fleet fuel economy (i.e. miles per gallon ratings), vehicle miles traveled (VMTs), performance measurement, and regional land-use planning.

The most substantial carbon reductions will be achieved by increasing Boston's fuel economy above the new federal corporate average fuel economy (CAFE) standards. While the City established a goal of reducing vehicle miles traveled by 7.5 percent below 2010 levels from the 2011 Climate Action Plan, the rise in fuel economy, as well as new analysis, can enable a lowered, more achievable VMT reduction target of 5.5 percent below 2005 levels. The City will maintain a goal of increasing its cycling mode share to ten percent from roughly two percent today. Public transportation, walking, biking, carpooling, and carsharing will all play a role in achieving this reduction goal. The implementation of the Boston Bike Network Plan, which also adopted the CAP's ten percent commuter

mode share goal, will be critical as well.

As we move towards implementation, Boston must have a clear understanding of how policies and programs are helping achieve these targets. Go Boston 2030 will develop a set of measures as part of a Mobility Index, which will incorporate measures that can reliably track fleetwide fuel economy and vehicle miles traveled, along with equity and economic development metrics in Boston.

However, even if Boston had the most sophisticated transportation system in the world, we must work regionally to address the over 300,000 commuters that come into or head out of the city five days a week. Over 70 percent of morning and afternoon commute traffic is from people who don't both live and work in Boston—meaning they are either commuting from outside the city into Boston, or are doing a reverse commute. As more jobs are brought into the greater Boston region, it is crucial for the City to work with surrounding municipalities, outlying suburbs, regional entities

and the Commonwealth to ensure a regional approach to land use and transportation is in place. Housing affordability in Boston and a top-tier public school system, for example, could allow more residents to live closer to a job in Boston instead of commuting from afar. A coordinated transportation management and public transportation program that provides compelling transportation options not only to Boston residents, but also those living in suburbs, will strengthen the entire region while reducing our collective carbon footprint.

2020 GOALS AND TARGETS

	2013 (CO ₂ e)	2020 Goal (CO ₂ e)	Percent of 2020 GHG Goal
Transportation	1.67 million metric tons	1.37 million metric tons	18 percent
Targets <ul style="list-style-type: none"> • Fuel economy target (TBD) • 7.5 percent reduction of 2010 VMTs <ul style="list-style-type: none"> ○ Residency rate target 			

STRATEGIES AND ACTIONS

1. FUEL ECONOMY

1.1 ESTABLISH A FUEL ECONOMY TARGET AND A STRATEGY TO ACHIEVE IT

New federal fuel economy standards will increase fuel economy of new cars by more than 40 percent. Boston aims to do more. Raising fuel economy, even by a small percentage, results in significant carbon reductions. Go Boston 2030 will establish a fuel economy target that allows for transportation to reach its GHG targets and will devise a strategy to target specific groups and technologies for education and outreach.

2. REDUCE VEHICLE MILES TRAVELED

2.1 MAINTAIN A VMT TARGET OF 7.5 PERCENT BELOW 2010 LEVELS

The 2011 Climate Action Plan set a target of reducing VMTs by 7.5 percent under 2010 levels by 2020. From new data, the City, through

Go Boston 2020, will aim to decrease VMTs by 5.5 percent below 2005 levels and importantly detail how travel mode share (percent of people driving, biking, walking and taking public transit) must change for this goal to be met. A draft analysis using data from the Census, for example, estimates that Boston must shift about 15,000 drivers (four percent of those that currently drive alone to work) to alternative transportation modes.

2.2 CREATE POLICIES THAT PUT ALTERNATIVE TRANSPORTATION OPTIONS ON AN EQUAL FOOTING WITH DRIVING

Many strategies from the 2011 CAP continue to be implemented, such as the parking freezes in Downtown, South Boston, and East Boston and transportation access plan agreements for development projects greater than 50,000 square feet. Go Boston 2030 will detail actions that continue the progress made in the past few years and

reflect the true social costs of driving a car.

2.3 ENCOURAGE MORE BIKING AND WALKING

The 2011 Climate Action Plan set a ten percent mode share target by 2020. Through Boston Bikes, Boston Transportation Department, Department of Public Works, cycling advocacy groups and other community partners, biking in the City has increased from less than one percent to roughly two percent commuter mode share for Boston residents in 2012. The Boston Bike Network Plan details actions to reach nearly 200 miles of bike lanes by 2020 while reducing the number of accidents by 50 percent. Hubway is also rapidly expanding into the neighborhoods, bringing access to bike sharing to more and more Bostonians. Complete Streets design principles have also been put into plan, providing safer

environments for both walking and biking.

2.4 CONTINUE TO EXPAND PUBLIC TRANSPORTATION COVERAGE AND SERVICE

Public transit is the backbone of transportation in the Greater Boston area, with 1.3 million riders on a daily basis. The Greater Boston area also has one of the highest rates of transit ridership in the country. To reach our targets, the City must work with the MBTA to ensure not only that it maintains a world-class level of service for existing residents as well as new residents and workers over the next five years, but also is able to increase its mode share via increased coverage and/or service.

2.5 INCREASE OPPORTUNITIES FOR CARPOOLING, RIDESHARING AND CARSHARING

Carpooling, ridesharing, and carsharing are key modes for reaching the Climate Action Plan goals, especially for those who commute long distances to get to

their jobs in Boston. In the long-term, by densifying the urban core and maintaining housing affordability, the City hopes to decrease the number of long-distance commuters. However, the City must convert a proportion of those driving alone from outside Boston to consider carpooling or ridesharing. While carpooling has declined significantly (from 10.7 percent in 1990 to 7.9 percent in 2012), new technology-enabled services and private buses make ridesharing more viable.

3. DEVELOPMENT, ZONING AND LAND USE

3.1 REGIONAL PLANNING

Much of Boston's VMTs originate from those living outside of Boston. If we can reduce these commutes by only a few miles each week, we can achieve vast congestion and carbon reductions. In order to accomplish this, Boston and the surrounding region needs a long-term strategy to provide more

Leading by Example: Hubway Bike Share

Since 2011, Boston has also been successfully operating Hubway, a bike-share program that the City of Boston and its surrounding cities and town (Brookline, Cambridge, and Somerville). To date, 140 stations with nearly 1,300 bikes are distributed throughout the Boston area. The program currently has more than 12,000 active members, and more than 6,000 rides taken daily.

Since its inception, the program has helped mitigated nearly 350 tons of CO₂, and allowed thousands of Bostonians to increase their comfort level with biking as a real and practical transportation option in Boston.

housing near jobs and public transportation. Boston can take the lead in supporting the Metropolitan Area Planning Council's (MAPC) regional planning efforts, and further encourage mixed-use zoning and

transit-oriented development in and around Boston.

3.2 ADOPT A RESIDENCY RATE TARGET OF 45 PERCENT

Transportation systems are intricately tied to land use patterns—where people live and work. Bostonians who live and work in Boston, for example, are twice as likely to not drive to work compared to those who work and live in the Greater Boston area. By attracting additional jobs and residents to Boston and raising the "residency rate"—the proportion of workers in Boston who also live in Boston—transportation carbon emissions can be reduced substantially.

4. Data and tracking systems

4.1 IMPLEMENT TECHNOLOGY AND DATA SYSTEMS THAT ENHANCE OUR UNDERSTANDING OF TRAFFIC AND VEHICLE TRAVEL IN THE CITY

The City's means of tracking fuel economy, commuter mode share, and vehicle miles traveled is limited. Much of the analytical work done for the Climate Action Plan used estimates and modeled data. Without clear measures that can be tracked year-over-year, progress towards the Climate Action Plan goals is unclear. Go Boston 2030 will create better and more regular data systems.

CLIMATE PREPAREDNESS

The 2014 Update continues the 2011 plan's theme of integrating climate preparedness into all planning, program development, and project reviews undertaken by the City. It also advances implementation through increased community and intergovernmental engagement. Lastly, as it has for many years, the City will strive to lead by example in preparing its own facilities and systems.

Because the City already touches the lives and businesses of its residents and visitors in so many ways, preparedness will increasingly be combined or achieved through other programs, such as public

health, economic development, emergency planning, energy, and trees and open space. This work will include incorporation of climate change criteria in existing programs, information, guidelines, and other resources for individuals, businesses, and neighborhoods taking action on their own, and, in some cases, new regulations or legislation.

Unlike climate change mitigation, where the total amount of greenhouse gases emitted serves as the overriding measure of progress, there is no single indicator that measures climate preparedness. The City will continue to monitor measures of risk (average sea-level,

average annual temperature, number of days over 90 degrees Fahrenheit, precipitation patterns, and so on). Some useful metrics are available in specific areas, such as the size of the city's tree canopy and the proportion of impermeable pavement, and specific programs (number of people who have participated in outreach programs). The City is working with local researchers and other cities to understand better indicators of urban and community preparedness.

1. PLANNING AND INFRASTRUCTURE

1.1 INTEGRATE PREPAREDNESS INTO ALL ASPECTS OF CITY PLANNING, REVIEW, AND REGULATION

Under the CAP Update, the integration will be continued, strengthened, and expanded, with a goal of ensuring that every opportunity to improve Boston's preparedness for climate change is exploited. All multi-year planning documents and permitting and other review processes will include analyses of and preparations for the effects of climate change. The City will coordinate these activities—for example, making sure that all offices are using similar climate projections and planning horizons—by ensuring that employees are appropriately trained and that high-level management is in place to establish cross-departmental consistency.

Cross-Cutting Theme: Economic Development

Climate preparedness is closely linked to economic development at both the large scale and the small scale. At the large scale, businesses will not choose to invest in Boston for the long term and individuals and families will not choose to live here, if the integrity of buildings, streets, public services, and essential infrastructure cannot be assured. On the other hand, climate preparedness will require investment in maintaining, upgrading, and modifying buildings, roads, parks, pipes, river beds, and much more, in projects large and small. The City will design programs and work with stakeholders to make those investments in ways that spur the creation of local jobs and businesses. Finally, economic development in itself generally increases preparedness, because a strong, prosperous community has more individual and community resources with which to meet the stresses that come with climate change.

Action	Description
1.11 Coordinate and prioritize city-wide preparedness efforts	Raise the priority of climate preparedness as a key component of all City planning and ensure City-wide coordination.
1.12 Establish a long-term planning framework	Start planning for the effects of climate change by the end of the century.
1.13 Incorporate preparedness into all project and permit reviews	Continue to integrate climate preparedness into zoning, all project and permit review and licensing and into the regulations and guidelines that govern these processes. Review and improve waterfront development zoning.

1.2 COORDINATE PREPAREDNESS EFFORTS REGIONALLY AND WITH STATE AND FEDERAL GOVERNMENTS

The City of Boston lacks authority to address many climate preparedness concerns because i) important natural features and built infrastructure extend beyond Boston’s boundaries (for example, the Charles River, MBTA subway lines) or ii) legal authority is specifically reserved for another level of government (for example, state responsibility for the building code and regulation of energy utilities). Although informal staff contacts and semi-formal stakeholder groups involving the City, neighboring municipalities, regional authorities, Commonwealth offices, and others have done much, the rising priority of and increasing activity around climate preparedness requires a stronger and more formal structure. The City will lead efforts to create such a structure. This work must go beyond planning documents and regulations to include active partnerships to identify and prepare vital regional infrastructure. Furthermore, regional coordination will encompass private property owners and businesses (see strategy 2.4) and the higher education community, which has interests in protecting its long-term physical presence in Boston and in generating, testing, and applying knowledge.

Action	Description
1.21 Convene a regional climate preparedness summit	Work with metro-Boston cities and towns, the Commonwealth and regional authorities to alignment and accelerate regional preparedness planning, development of regulatory requirements, infrastructure investment, and other programs and policies.
1.22 Develop city-university research partnerships	Develop a partnership with research universities to develop, analyze, test, and implement new climate-preparedness strategies.

1.3 LEAD BY EXAMPLE

The primary reason for the City of Boston to continue increasing the climate preparedness of its own operations is to ensure that City agencies can serve residents, workers, and visitors under all circumstances. For this purpose, the City will use the priorities identified in the October 2013 report *Climate Ready Boston: Municipal Vulnerability to Climate Change* as an important factor in its capital budget decisions. The City’s work on its facilities will also serve as examples—of motivation and of specific measures—for other property owners who may be struggling to determine what steps they should take. Furthermore, the City can use its facilities to serve as pilots for relatively new or innovative approaches, including for example, the use of district energy or combined heat-and-power

installations as a general preparedness measure or the combination of photovoltaics with storage batteries as a source of emergency power.

Action	Description
1.31 Address municipal vulnerabilities	Address municipal building, infrastructure, and operational vulnerabilities identified in the 2013 assessment, and report on progress annually.
1.32 Pilot preparedness solutions	Use City-owned facilities and land to provide climate-preparedness examples and pilot innovative solutions.

2. COMMUNITY ENGAGEMENT

2.1 USE CLIMATE PREPAREDNESS TO SPUR ECONOMIC DEVELOPMENT AND CREATE JOBS.

Boston's energy programs have already had success in fostering local business creation and job growth while reducing energy use and greenhouse gas emissions. The City will ensure that its preparedness programs have a similar mindfulness to the potential for combining climate and economic goals. Just as with energy efficiency, climate preparedness (for example, tree plantings, urban agriculture, infrastructure construction) requires work on the ground. Furthermore, neighborhoods that are healthier and stronger—in community cohesion, economic vitality, and public health—are, for that reason alone, better prepared for climate change and other stresses.

Action	Description
2.11 Focus on neighborhood level strategies	Work with community leaders, community development agencies, and others to create neighborhood-based programs that increase climate preparedness while supporting job training and job creation.
2.12 Invest locally	Invest in smaller-scale resiliency interventions and pilots in particularly vulnerable areas.

2.2 TARGET ASSISTANCE TO LOW-INCOME RESIDENTS, SMALL BUSINESSES, AND OTHER VULNERABLE POPULATIONS AND ENTITIES.

Although all segments of the Boston community face increasing risks from climate change, some segments are more vulnerable because of socioeconomic factors. The City of Boston will increase its efforts to inform particularly these groups about climate preparedness and to identify resources that could assist these groups in taking action. Small businesses also, in general, are more vulnerable to the increasing risks from climate change than large ones, and the City will reach out to them. In both cases, the City will try to build on existing programs that already serve these groups—through, for example, the Public Health Commission and the Department of Neighborhood Development. A final group that will require specific attention is workers, especially those who work outside and could suffer in extreme weather. The City will bring together stakeholders to explore formal and informal means of ensuring worker safety as the climate changes.

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Action	Description
2.21 Collaborate with public health	Add climate preparedness elements to public health programs already aimed at vulnerable populations and low-income households.
2.22 Identify potential resources	Explore opportunities to provide financial and technical assistance to vulnerable populations and low-income households in reducing current vulnerabilities.
2.23 Support the resiliency of small businesses	Work with Main Street programs and other stakeholders to assist small businesses in increasing preparedness and developing business continuity plans.
2.24 Protect outdoor and manual workers	Work with unions, businesses, the Commonwealth, and other stakeholders to protect workers in extreme weather.

2.3 PROVIDE INFORMATION THAT ENABLES COMMUNITIES TO TAKE ACTION AND INFLUENCE PROGRAMS AND POLICIES.

Scientific climate change projections are generally stated as ranges (for example, between eight inches and six feet of average global sea-level rise by 2100) associated with corresponding probabilities of certainty. This often makes planning and decision making difficult on such long horizons. To establish a consistent basis for preparing for climate change, the City of Boston will establish a set of climate scenarios (amounts of change at a given time) to be used for planning and other actions. These scenarios, however, only outline the risks that the city faces. The City will also develop a set of indicators that provide some objective measure of how well Boston is prepared to face those risks, and establish preparedness goals based, at least in part, on those indicators. Both sets of information - scenarios and indicators—will be important tools for informing the community about climate vulnerability, establishing bases for action, and providing a common understanding for city-wide and neighborhood-specific discussions of preparedness priorities.

Action	Description
2.31 Provide accessible climate data and projections	Ensure that all municipal offices and the community have up-to-date climate change projections and planning levels (scenarios) in sufficient detail to support neighborhood-level planning and design.
2.32 Establish preparedness indicators	Develop a set of indicators to provide quantitative measures of the preparedness of the Boston community, set goals in terms of these indicators, and report on them annually.
2.33 Improve and expand neighborhood engagement	Expand public outreach to neighborhood groups to inform and motivate all sectors of the community around preparedness, and better understand neighborhood needs and priorities.

2.4 SUPPORT PROPERTY AND BUILDING OWNERS IN TAKING PREPAREDNESS ACTION.

Property owners, businesses, and institutions have an essential role in climate preparedness, because they must take responsibility for protecting their own material interests. Especially in the next couple of decades when climate changes are relatively small (compared to what is likely by the end of the century) changes to individual buildings and businesses practices can improve preparedness significantly. The City will work with diverse stakeholders to provide practical information, raise awareness, and explore resources, especially for smaller property owners and businesses. The insurance and financial sectors, in particular must be at the table. They often have considerable influence in, and can provide financial incentives for, establishing better practices, especially for existing buildings. The City must also pay special attention is businesses and properties with toxic or hazardous materials. Although it is the responsibility of the owners to ensure the security of these materials, the City—in an extension of the scrutiny it already gives such properties through its public safety offices—will re-examine their vulnerability in light of climate change.

Action	Description
2.41 Provide preparedness information	Work with property owners, neighborhood groups, and other stakeholders to establish building preparedness priorities, best practices, guidelines for implementation, and cost/benefit information.
2.42 Increase awareness of vulnerabilities and actions	Ensure that all property owners and tenants are specifically aware of their climate-change vulnerabilities.
2.43 Expand resources	Explore mechanisms to provide property owners financial and technical support for increasing climate preparedness.
2.44 Align insurance policies	Work with the Commonwealth, the insurance and finance sectors, and property owners to identify modifications to building codes in accordance with, and align insurance policies and incentives and loan underwriting with, best practices in building resiliency.
2.45 Assess vulnerabilities of hazardous materials and sites	Determine the vulnerability of sites with inventoried toxic/hazardous materials and other sites that may create greater vulnerability to the community and ways to increase their preparedness.

3. TREES AND OPEN SPACE

3.1 EXPAND GREEN INFRASTRUCTURE AND ECOSYSTEM-BASED APPROACHES TO ADDRESS CLIMATE VULNERABILITIES.

Green infrastructure—parks, trees, wetlands, beaches, and other open space—is a valuable tool in climate preparedness, particularly for mitigating heat and stormwater, as well as for all the other benefits it brings. The City already enforces legal requirements for green infrastructure, for example, protection of wetlands under the Commonwealth's Wetlands Protection Act and of street trees under a municipal ordinance. It also has policies and programs that strongly encourage and facilitate green infrastructure including Complete Street guidelines, stormwater management requirements under Boston Water and Sewer Commission regulations, the urban agriculture zoning code and programing, and tree planting goals and initiatives. The strategies under this action are aimed at strengthening formal requirements and accelerating supporting programs. Of particular importance will be determining the appropriate ways of incorporating projected sea-level rise into legislation or regulation to both allow climate-prepared development where appropriate and protect and expand coastal resources.

Action	Description
3.11 Expand green infrastructure requirements	Explore legislative and regulatory means of expanding requirements for green infrastructure and coastal protection, such as through a local wetlands ordinance.
3.12 Grow the urban tree canopy	Develop and implement a clear plan for significantly increasing tree-canopy cover.
3.13 Explore community-wide stormwater fee	This fee can be based on a property's permeable surface area and stormwater management efforts.
3.14 Accelerate neighborhood stormwater management actions	Explore a pavement-to-parks/water absorption plan for neighborhoods.
3.15 Increase support and space for urban agriculture	Expand urban agriculture and study the resilience of our regional food system.

4. BUILDINGS AND ENERGY

4.1 EXPAND ENERGY EFFICIENCY, SOLAR AND OTHER TYPES OF DISTRIBUTED ENERGY AS A RESILIENCE MEASURE.

The expansion of energy efficiency, renewable energy, and district energy are key components of the CAP's strategies to reduce greenhouse gas emissions. They also contribute to climate preparedness because they make the city less reliant on the regional energy network, which itself will confront greater stresses with climate change (for example, greater demands for electricity during heat waves, greater physical stresses from more intense storms). This strategy and its actions call for increased recognition of the preparedness benefit in the City's and utilities' existing energy programs.

Action	Description
4.11 Expand distributed energy systems	Expand district energy, combined heat and power, and other types of distributed energy and storage, particularly in districts with critical facilities.
4.12 Expand and align outreach to residents	Include climate preparedness as a consideration in Renew Boston's energy programs and its outreach activities.

80x50

This chapter initiates the conversation on how Boston can position itself to reach its long-term goal of reducing carbon emissions 80 percent by 2050 (80x50), while creating a vibrant, sustainable and equitable city.

As we look to 2050, it is difficult to predict what Boston might look like. Yet, Boston must begin to frame this long-term goal with a set of broad strategies to put the city on a path to a near-carbon neutral city by 2050. In many cases, there are actions that can be taken in the next ten years to make this path more visible. These actions are included in the sections below.

CORE OBJECTIVES / STRATEGIES

1. INTERIM CARBON TARGET

As we get closer to 2020 and continue to make progress towards achieving our 25 percent reduction goal, Boston must begin to look to 2050. While 2050 may be too far off to plan for concretely, 2030 is an appropriate next horizon, especially given other 2030 planning efforts underway, such as the City's mobility and housing plans, Go Boston 2030 and Housing a Changing City, respectively. A 2030 interim carbon reduction target that sets us on track to achieve 80x50 will be an important part of these planning efforts, especially as we move towards implementation.

A 2030 goal will also help guide policies and program decisions to be made in the next ten years. If Boston does not begin to look beyond 2020, our progress could face a lag. A 2030 goal will enable Boston to set sector specific targets, similar to what we have now for 2020. As growth projections and a vision for Boston in 2030 are developed, a 2030 greenhouse gas reduction goal will be important. The 2030 goal, and targets that follow it, should maintain an eye towards the 80x50 goal. Further research should be conducted to understand how aggressive we should be for the periods between 2020, 2030, and 2050.

In the next ten years, the City should explore the following:

- The use of indicators of success beyond traditional measures of economic growth (GDP)
- A consumption-based inventory (one that accounts for emissions associated with products and food we buy and consume)
- A focus on carbon neutrality by 2050, and integrating this goal into all planning activities
- Developing 80x50 sector goals
- Zero-carbon standards for new development

2. CARBON NEUTRAL VISIONING

Boston will not be able to achieve 80x50 without federal, state, and regional support and cooperation. The utility companies and their regulatory bodies, such as the Public Utilities Commission, must play a significant role. The 80x50 goal will have to be a core consideration of all investments and policies that impact our built environment, especially large infrastructure investments that tend to have long lifespans. In the next ten years, the City of Boston should work to convene these bodies to establish a shared vision for a low-carbon Boston.

In the next ten years, the City should explore the following:

- Create a formal mechanism for coordination and alignment of state, regional, and city climate planning.

DECARBONIZING THE GRID

There are some structures already in place that, if operated under a shared 80x50 vision, could help Boston and the broader region make significant progress towards 80x50. The Regional Greenhouse Gas Initiative (RGGI) is the region's cap and trade system for carbon emissions. If the cap on power plant emissions continues to be lowered, our electricity supply will become less carbon intensive. Nonetheless, energy efficiency will remain critical because based on current technology and projections, a fully decarbonized grid would be unlikely based on our current energy demands (in part due to the fluctuations in renewable sources caused by cloudy days and solar energy, for example). We must minimize our energy consumption so that the energy required going forward can be met with clean, renewable energy sources.

Progress is being made on the state-level as well. The Commonwealth of Massachusetts has also adopted an 80x50 goal through the Global Warming Solutions Act. More recently, the Massachusetts's Department of Public Utilities issued an order in June 2014 to modernize the electric grid, requiring all electric distribution companies to submit a ten-year grid modernization plan in the next six months. This plan requires utilities to describe their progress towards reducing the effects of outages, optimizing demand by reducing system and customer costs, increasing distributed resources such as renewables, electric vehicles and microgrids, and improving workforce and asset management.

On the local level, Boston can also work towards creating local, district-level energy systems. This approach enables greater control over fuel sources and can incorporate local renewable energy sources. While there are current regulatory barriers to this strategy, the City continues to make progress on district energy. And there are signs that the state is moving in this direction as well. For example, the state legislature passed a bill that promotes the use of clean energy for heating and cooling buildings to take effect on January 1, 2015. The bill provides financial incentives through "alternative energy credits" for investing in local renewable energy sources, among others, and will lead to statewide reductions in carbon emissions. While the market for renewable electricity has grown rapidly through, for example, solar photovoltaic and wind, heating is more than half of the state's energy use and 80x50 will require new means of looking at these technologies.

In the next ten years, the City should explore the following:

- A carbon-neutral district energy system
- The feasibility of district cooling, particularly through the use of ocean water
- Expanding funding mechanisms for district energy
- District heating and cooling for municipally owned facilities
- Legal and regulatory impediments to district energy and renewables
- Standardized rules, minimal fees, and an adequate feed-in tariff for grid interconnection
- The continued lowering the cap on greenhouse gas emissions through RGGI

- Ensuring PV owners can interconnect to the grid with standardized rules, minimized fees, and reasonable feed-in tariffs
- More aggressive state-wide clean energy goals, and the use of those goals to evaluate proposals for energy infrastructure
- A city-wide or regional carbon tax

LOW-CARBON TRANSPORTATION

If we achieve a low-carbon electricity grid, electric transportation options will then be low-carbon as well. While Boston will continue to pursue strategies for reducing automobile travel throughout Boston, it is likely that the car and other personalized transportation will still be substantial in 2050. The City will have to work with state and regional partners to examine an all-electric transportation system, including electric vehicles and electric public transportation. This will require major infrastructure investments and considerations that again, should be on the table in the next ten years or so. Boston should also support research for other low-carbon and innovative transportation alternatives, such as hydrogen vehicles, self-driving vehicles and time-based pricing.

In the next ten years, the City should explore the following:

- Boston representation on the board overseeing the MBTA
- A tax-and-invest program in public transit alongside state carbon tax
- Additional public transit measures (for example, a City-run bus or shuttle fleet) to supplement the MBTA system.
- Expanded public and private infrastructure to support electric vehicles
- Other zero-carbon vehicles (for example, hydrogen-powered) and associated infrastructure to support them
- Working with Commonwealth and MBTA to transition the MBTA to net-zero carbon energy sources
- A zero-carbon municipal vehicle fleet by 2030.

3. CONTINUED RESEARCH AND LEARNING

Boston is not the only entity thinking seriously about how we shift to a low-carbon city. European cities are leading examples of this effort, but the Commonwealth of Massachusetts, New York City, New York State, the City of Seattle, and many others in the U.S. have similar goals.

Copenhagen, for example, is planning to be the world's first carbon neutral city by 2025. Carbon neutrality provides the framework and the vision to make the city not only greener but healthier, more livable, safer, smarter, and more prosperous for all of its residents. To meet this ambitious goal, the city will reduce energy and heat consumption through highly energy efficient construction standards alongside innovative financing models, and create a digital city infrastructure for monitoring and conserving energy. Copenhagen will move towards city-wide carbon neutral district heating, build 100 new wind turbines, convert power stations to biomass, and in doing so create many local green jobs. To reduce car dependence, the city will expand bike and public transit networks, intelligent traffic management, and infrastructure for electric vehicles.

New York City has also conducted an 80x50 study. The city found that meeting this goal would require “change at an unprecedented scale” dependent on large investments into energy efficiency and clean energy infrastructure, low-carbon transportation systems, and “transformation of the solid waste sector.” The study concluded that the prospect of achieving 80x50 is likely dependent on achieving its goal of a 30 percent carbon reduction by 2020. New York City recognizes the need to find solutions to connecting large-scale renewable energy sources and restructuring the current power utility regulatory model, in addition to almost entirely shifting away from cars that run on fossil fuels. In working towards 80x50, New York City would create new jobs, expand economic activity, and increase resiliency through distributed generation and retrofitting power plants—but the city could not do it without the support of federal and regional regulation.

The City of Boston is well positioned to learn from these studies and planning efforts, as well as leverage its university and other research institutions to conduct similar work in Boston. In the near-term, Boston should work with regional partners and stakeholders to explore how Boston and the region can move towards a carbon

neutral grid, as well as carbon-free transportation systems. The City should also explore ways to support innovative business models and new financing mechanisms that help us get to 80x50.

In the next ten years, the City should explore the following:

- Research partnerships to solve climate mitigation and adaptation technical challenges
- Innovative business models and startups
- Smart investments and new financing models to support large scale and neighborhood level resiliency and sustainability
- Creating the educational base, green-STEM job skills and pipelines, businesses, and economic structures

4. A TRANSFORMATION OF THE ENVIRONMENTAL AWARENESS OF ALL BOSTONIANS

As noted throughout the plan, community engagement and individual action is an important strategy for meeting even Boston's near-term climate goals. However, if we are going to shift to a low-carbon economy, we will need a much broader transformation. Not only is this environmental awareness important for driving participation in programs, but also it is needed in order to support the tough policy decisions that will need to be made between now and 2050.

Continued efforts to focus on youth and environmental education will be critical. Boston should also maintain its focus on strategies that connect people to their local environments, but are not necessarily directly connected to carbon emissions, such as waste diversion efforts and maintaining open space and access to the natural world.

In the next ten years, the City should explore the following:

- New ways to involve the community in sustainability and preparedness decision-making, implementation, and evaluation
- Self-sustaining and climate resilient eco-districts
- A fully-integrated sustainability curriculum
- Community-scale anaerobic digestion pilots