



CLIMATE ACTION

Fiscal Year 2020 Report

LETTER FROM THE CHIEF

Dear neighbors,

Climate action is key to Mayor Walsh's vision for Boston: Mayor Walsh is committed to preparing for and mitigating climate change. We're already seeing the effects of climate change in Boston – extreme heat, more intense and frequent storms, and rising sea levels. These changes impact Boston's communities of color, low-income communities, and other socially vulnerable populations, first and hardest. Equitable climate action is environmental justice and is necessary to ensure Boston becomes a healthy, thriving, resilient city for all.

Progress we've made so far: We have committed to carbon neutrality by 2050 and created the first-ever vision for a resilient Boston Harbor and coastline. In the 2019 update, we outlined 18 strategies to decrease carbon emissions from our buildings and transportation. Climate Ready Boston continues to listen to our communities and develop neighborhood-specific plans to adapt to climate change. Step by step, we are working towards completing the Climate Action plan's goals.

Moving from planning to implementation: Over the past five years, we've been planning for how we will adapt to climate change, how we will become carbon neutral, and how we will achieve a zero-waste Boston. As we implement our plans, we will continue to prioritize flexibility, adaptation and equity, because science and best practice are always changing. As we've seen the City face COVID-19, it has become even more clear to us how important it is to listen to experts, work closely with community partners, and address climate change now.

Transparency: We've worked with communities in Boston to inform and create these plans. They are plans for Bostonians to live healthy, resilient lives. As we implement your plans, we want to be transparent about what's been implemented, and what we're still working on.

Together, we're doing our part: Our climate action plans are ambitious and necessary. Their implementation is going to rely on continuous creativity, teamwork, and collaboration across all City departments, community partners, businesses, and residents.

Get involved: Greenovate Boston serves as an opportunity for residents to join us in reaching our climate action goals. We can't do it without you. This report includes stories from Greenovate Leaders that are taking action in their communities. If you see an action in one of our plans that's in progress or hasn't been started yet, but you're ready to take action – reach out.

We look forward to continuing our fight against climate change and best preparing our City for a healthier, more sustainable, and resilient future.

Sincerely,
Chris Cook



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1. INTRODUCTION

I. WHY WE CREATED THIS REPORT

This report presents up-to-date information regarding the status and implementation of the City of Boston's plans and initiatives around climate, energy, and waste. These include:

- The 2019 Climate Action Plan Update,
- Climate Ready Boston and neighborhood-specific coastal resilience plans,
- Zero Waste Boston,
- Greenovate Boston, the City's initiative to empower residents to act on climate.

This report is the first of what we expect to be annual reports. With it, we invite you, our partners and stakeholders, to share in climate action in Boston.

II. WHAT'S THE STATUS?

Our plans include short- and long-term actions. We are using the following designations to describe each one's status:

- **Not started:** The step has not begun implementation.
- **In progress:** The step is underway (e.g., a grant application has been submitted to create a program).
- **Delayed** (2019 CAP only): The implementation of this step is delayed; each step is assigned a timeline in the 2019 Climate Action Plan Update.
- **Ongoing:** A step that calls for a recurring action (e.g., a taskforce that meets regularly) is ongoing. If its implementation is suspended, it will become "delayed".
- **Complete:** The step is complete and all milestones have been reached.



III. BOSTON'S CLIMATE GOALS AND COMMITMENTS

The City of Boston has a long history of climate action, releasing our first citywide climate action plan in 2007. Since then, the City has adopted ambitious long-term climate action goals, including for mitigation, adaptation, waste reduction, mobility, and community connectedness. Achieving these goals will help Boston become a healthy, thriving and resilient community.

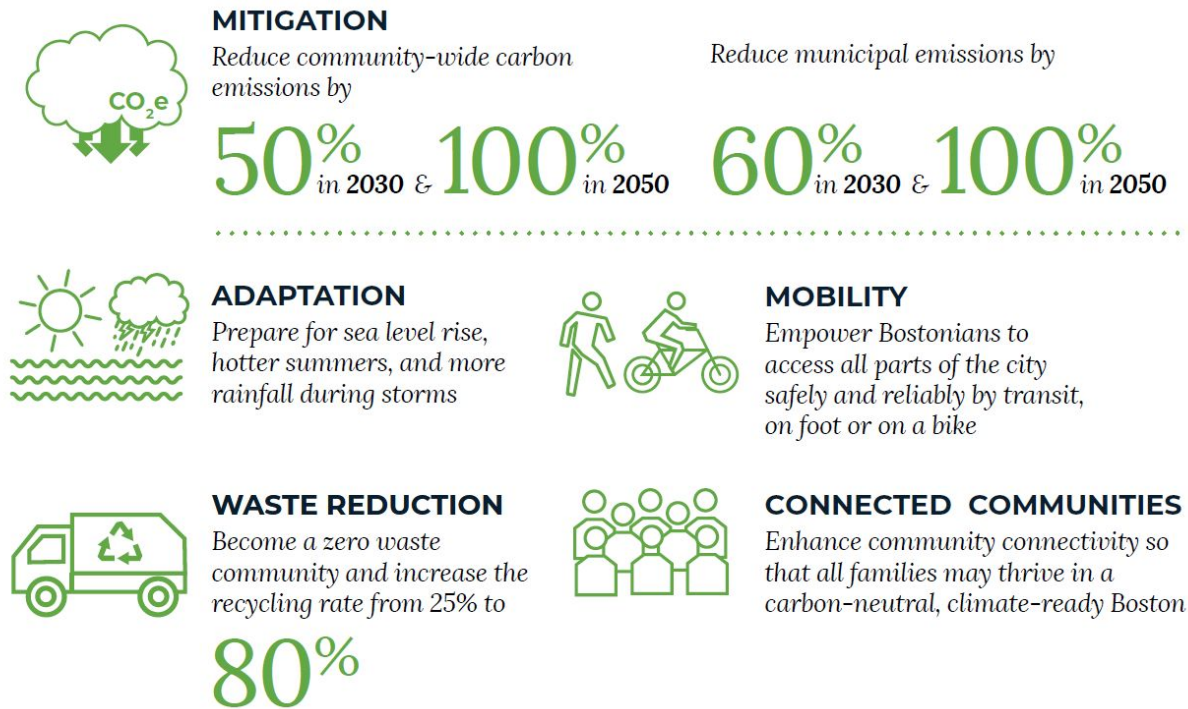


Figure 1. Summary of Boston's climate goals.

The City of Boston is committed to simultaneously addressing racial and social equity and environmental challenges. Vulnerable groups such as communities of color and low-income neighborhoods are often disproportionately impacted by environmental shocks and stresses and are less likely to have access to the resources necessary for recovery. Climate action in Boston has two guiding principles for equity:

1. People of color and low-income communities must not be disproportionately impacted by climate hazards.
2. Benefits from climate mitigation and preparedness efforts should be shared equitably among all people.

The City is also committed to global leadership and regional collaboration, in addition to engaging civic, business and institutional leaders in climate action. Our partnerships include:

- Metropolitan Mayors Coalition,
- Urban Sustainability Directors' Network,
- Climate Mayors,
- C40 Cities Climate Leadership Group,
- Global Covenant of Mayors for Climate and Energy.



2. REDUCING CARBON POLLUTION

I. 2005-2018 GREENHOUSE GAS INVENTORY

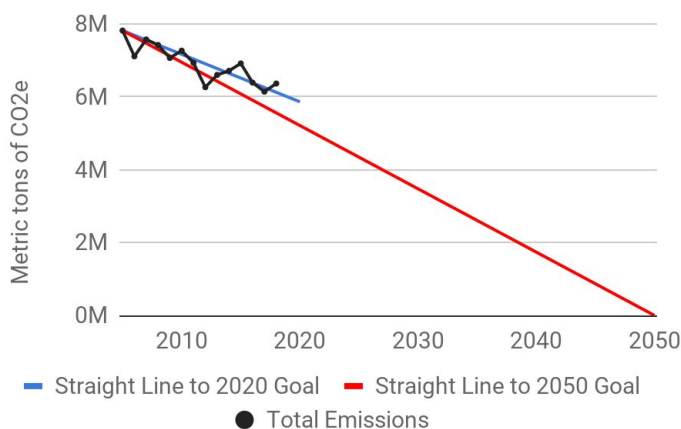
The City of Boston has released an annual inventory of carbon emissions attributable to the City’s residents and economic activity since 2005. The inventory allows the City to understand where our emissions come from, quantify the potential impacts of programs and policies to reduce emissions, and track progress towards our goals. The inventory accounts for emissions from energy use by residents, businesses and other activities, on- and off-road transportation (excluding airplanes), and waste disposal. To compile the inventory, we incorporate data from Boston utilities, data on fuel oil and vehicle fuel consumption, and a combination of measured and modeled transportation data. The City intends to develop in the next few years a consumption-based emissions inventory, which would include emissions from the production, shipping, use, and disposal of each product and service purchased and used by Boston residents and workers.

Between 2005 and 2018, Boston’s emissions decreased by approximately 19 percent, from 7.9 to 6.4 million metric tons of carbon. When adjusted for renewable energy credits purchased by the City of Boston and large buildings, Boston’s emissions have decreased by an additional 1 percent. The reduction in Boston’s emissions occurred at the same time that the population and the number of jobs in Boston have increased. Per capita emissions have decreased from 15 metric tons of carbon in 2005, to 9 metric tons in 2018. Emissions per million dollars of Gross City Product (GCP) have fallen from 76 to 49 metric tons of carbon per million dollars over the same period.

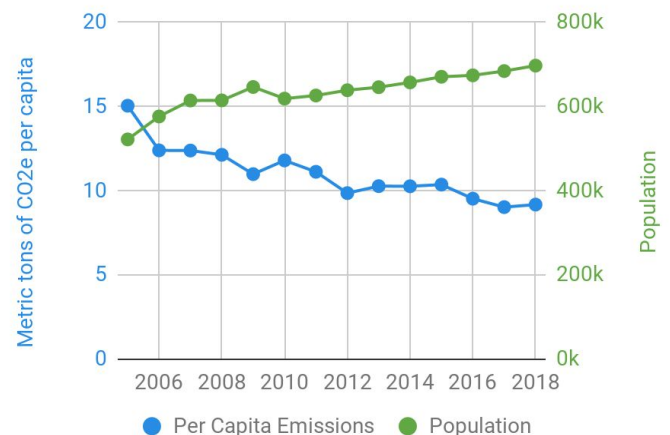
Almost all of the Boston community’s carbon emissions stem from the building and transportation sectors. Buildings account for 71 percent of total emissions. Transportation accounts for 29 percent of remaining emissions.

Boston is at risk of not meeting our 2020 carbon target of reducing carbon emissions by 25 percent from 2005 levels. Due to the COVID-19 pandemic, 2020 energy use patterns are not likely to be consistent with that of previous years, and may not be a reliable indicator of actual progress towards our carbon emissions reduction goals.

BOSTON COMMUNITY-WIDE EMISSIONS



BOSTON EMISSIONS PER CAPITA



II. 2019 CLIMATE ACTION PLAN

This section identifies our progress toward carrying out the 18 strategies laid out in the [2019 Climate Action Plan](#). The 2019 update to Boston’s Climate Action Plan details key actions to get Boston on track to become carbon neutral by 2050. Each action page included a section that detailed steps for equitable outcomes and implementation. The 2019 plan itself builds on the 2014 update, which identified 98 actions to make Boston a connected community that is low carbon, climate ready and zero waste.

I. CONSTRUCT NEW MUNICIPAL BUILDINGS TO A ZERO NET CARBON STANDARD

STEPS	STATUS	DETAILS
Construct new municipal buildings to a zero net carbon standard	COMPLETE (ongoing)	Mayor Walsh signed an executive order for carbon-neutral municipal buildings in December 2019.

2. ADOPT A ZERO NET CARBON STANDARD FOR CITY-FUNDED AFFORDABLE HOUSING

STEP	STATUS	DETAILS
New construction		
1. Release Guidelines for Zero Emissions Buildings (2019)	COMPLETE	Neighborhood Development (DND) released a draft for public comment .
2. Identify high-carbon intensive building materials to avoid and suggest greener, alternative materials (2019-2020)	IN PROGRESS	Draft guidelines recommend avoiding carbon-intensive materials and toxic foams.
3. Give special consideration in 2019 funding round to Zero Emission Buildings (2019)	COMPLETE	Proposals for zero emission projects were “highly considered” in FY19.
4. Update DND Request for Proposals (RFP) language to reflect new standards (2020)	COMPLETE	\$30 million in funding for new zero emission and accessible affordable housing announced in August 2020.
5. Connect facilities managers to Building Operator Training programs (ongoing)	ONGOING	LISC Boston organized a Building Operator Certification training course for 21 affordable housing facilities managers at the end of 2019, including from the Boston Housing Authority.
Existing buildings		
1. Assess existing affordable housing stock and strategies for deep energy retrofits with combined electrification (2020)	IN PROGRESS	Neighborhood Development and Environment are studying affordable housing in the performance standard. (See Strategy 5: Develop a carbon emissions performance standard to decarbonize existing large buildings).
2. Partner with affordable housing providers and residents to demonstrate deep energy retrofits (starting 2020)	IN PROGRESS	A local affordable housing provider is participating in the Rocky Mountain Institute’s REALIZE initiative.
3. Develop design guidelines for deep energy retrofits with electrification (by 2022)	NOT STARTED	
4. Update RFP language to reflect deep energy retrofit and electrification strategies (by 2022)	NOT STARTED	



3. STRENGTHEN GREEN BUILDING ZONING REQUIREMENTS TO A ZERO NET CARBON STANDARD

STEP	STATUS	DETAILS
1. Require that building developers submit a Carbon Neutral Building Assessment as part of Article 37 zoning review requirements (2019)	COMPLETE (ongoing)	As part of Article 37 Green Building and Climate Resiliency Guidelines review, developers are required to include a project-specific Zero Carbon Building Assessment .
2. Promote new ZNC buildings in the Boston area to improve knowledge of ZNC costs and best practices (ongoing)	IN PROGRESS	Resource: Built Environment Plus (formerly U.S. Green Building Council Massachusetts) published a report in 2019 on zero energy buildings in Massachusetts, including 3 residential buildings in Boston.
3. Launch technical analysis and public process (2019-2020)	IN PROGRESS	The Boston Planning and Development Agency (BPDA) is conducting technical analysis and has launched the Zero Net Carbon Zoning Initiative .
4. Enact new zoning requirements and timeline for implementation (2020)	NOT STARTED	
5. Evaluate the creation of a carbon linkage fee (starting 2020)	NOT STARTED	
6. Communicate, educate, and oversee compliance of ZNC building requirements (starting 2021)	NOT STARTED	

4. INVEST IN ENERGY EFFICIENCY AND RENEWABLE ENERGY GENERATION IN MUNICIPAL BUILDINGS

STEP	STATUS	PROGRESS
1. Complete Phase 1 projects 2019-2020	COMPLETE	The Renew Boston Trust is the City's initiative to invest in energy efficiency and resiliency in the City of Boston's buildings, using creative financing. Learn about the initiative and the efficiency measures we've carried out on our website.
2. Select building portfolio and carry out energy assessments for Phase 2 (2019)	COMPLETE	
3. Explore developing a separate energy service contract for streetlights (2020)	IN PROGRESS	
4. Complete design and begin installation of Phase 2 energy conservation measures (by mid-2020)	IN PROGRESS	
5. Select building portfolio, including schools, and carry out energy assessments for Phase 3 (by late 2020)	IN PROGRESS	
6. Secure funding and begin early scoping for Phase 4 (by 2021)	NOT STARTED	
7. Complete design and begin installation of Phase 3 energy conservation measures (by early 2021)	NOT STARTED	



5. DEVELOP A CARBON EMISSIONS PERFORMANCE STANDARD TO DECARBONIZE EXISTING LARGE BUILDINGS

STEP	STATUS	PROGRESS
1. Introduce a building performance scorecard for BERDO buildings (2019)	IN PROGRESS	Beta versions were shared with building owners in 2019.
2. Launch the technical analysis and public process to develop a building emissions performance standard (by 2020)	IN PROGRESS	Environment is convening a technical advisory group and has launched a community process to inform policy.
3. Expand financing mechanisms for retrofits, including exploring the creation of a local climate bank (starting 2020)	IN PROGRESS	Environment is working with Vivid Economics to develop a climate bank concept paper.
4. Engage with utility companies to improve the process for building owners to obtain and report their energy data (ongoing)	ONGOING	BERDO staff coordinate with Eversource and National Grid on an ongoing basis.
5. Develop guidance for combined deep energy retrofits and electrification, including for historic buildings (by 2021)	NOT STARTED	
6. Propose amendment to BERDO to replace energy action and assessment requirement with the building emissions performance standard (by 2021)	NOT STARTED	
7. Pilot deep energy retrofits with thermal electrification in the 15 Carbon Free Boston building typologies (2020-2024)	IN PROGRESS	The Green Ribbon Commission and BSA are documenting retrofits. The RMI-REALIZE project is also piloting an affordable housing retrofit.
8. Study mechanisms to improve the energy efficiency of existing buildings not covered by the standard (2020-2024)	NOT STARTED	

6. EXPAND WORKFORCE DEVELOPMENT PROGRAMS FOR BUILDING DECARBONIZATION

STEP	STATUS	PROGRESS
1. Regularly convene an internal City working group on workforce development for energy efficiency and green buildings (starting 2019)	ONGOING	Workforce Development , Economic Development and Environment are meeting regularly.
2. Estimate baseline and future construction labor needs to meet carbon neutrality goals (2019-2020)	IN PROGRESS	We are working with Inclusive Economics to assess additional labor needs.
3. Pilot and coordinate training programs and support partner-led programs (starting 2019)	ONGOING	In 2019, we supported LISC Boston and Emerald Cities Collaborative trainings.
4. Develop new facilities management training and job opportunities for municipal building staff (2020-2021)	IN PROGRESS	The Municipal Energy Unit is collaborating with Workforce Development to evaluate.
5. Expand technical offerings and career pathways in Boston Public Schools (starting in 2020)	NOT STARTED	



7. ADVOCATE FOR STATE BUILDING POLICIES THAT ALIGN WITH CARBON NEUTRALITY BY 2050

STEP	STATUS	PROGRESS
1. Provide public comment and support as part of the BBRS process to study a ZNC update to the Stretch Code	ONGOING	Environment staff attend both all-board and energy advisory committee meetings (mass.gov).
2. Advocate for energy efficiency programming that supports whole-building deep energy retrofits at the Massachusetts Energy Efficiency Advisory Council (EEAC)	ONGOING	Environment sits on the GWSA Implementation Advisory Committee , supporting the development of the 2030 Clean Energy and Climate Plan.
3. Advocate for state policy changes that support residential energy efficiency	ONGOING	Environment sits on the GWSA Implementation Advisory Committee .
4. Participate in Energy Code Conference to cast votes in favor of energy efficiency proposals	COMPLETE (ongoing)	Staff voted on the 2021 International Energy Conservation Code .

8. ADVOCATE FOR BOSTON'S PRIORITY TRANSIT PROJECTS WITHIN REGIONAL PLANS

STEP	STATUS	PROGRESS
1. Advance a service enhancement proposal for the Fairmount Line (2019)	IN PROGRESS	Transportation and MBTA collaborated to add 8 trips to the Fairmount Line and are evaluating additional steps to improve service. (Learn more.)
2. Create Boston's first Bus Priority Network and implement three or more bus priority projects per year (starting 2019)	IN PROGRESS	Several rapid bus projects are in design or in progress (Learn more.)
3. Expand Inner Harbor ferry service from Lovejoy Wharf, Fan Pier, Lewis Mall, and other new local ferry routes (ongoing)	IN PROGRESS	Ferry service has started between Lovejoy Wharf and the Seaport. (Learn more.)
4. Support upgrading the Silver Line to provide better rapid bus service and terminal from downtown to Nubian Square (2019-2020)	IN PROGRESS	Transportation added new dedicated bus lanes in Chinatown and Downtown and will partner with MBTA to improve key transfer points. (Learn more.)
5. Support technology improvements to increase Green Line speed and reliability (2019-2020)	IN PROGRESS	Real-time displays and signal priority will improve speed. (Learn more.)
6. Support flood protection and carbon reduction measures for at-risk MBTA stations (ongoing)	NOT STARTED	Transportation is seeking to ensure that T stations are resilient and climate ready. (Learn more.)
7. Create new transit hubs or carry out improvements at existing hubs in the Longwood Medical Area, at West Station, and in Sullivan Square (ongoing)	IN PROGRESS	Several transit hub improvement projects are in implementation. A new West Station Transit Hub is part of MassDOT's I-90 project. (Learn more.)
8. Increase sense of transit reliability through realtime information integration initiative, with 20 pilot locations across the Boston area (starting 2020)	IN PROGRESS	Transportation created a bus priority network across the City and will introduce a suite of reliability enhancements. (Learn more.)
9. Advocate for measures that reduce the cost and improve the quality of public transit in Boston (ongoing)	IN PROGRESS	The City gave free T passes to all middle and high school students and helped support night bus service. (Learn more.)



9. IMPROVE AND EXPAND ACTIVE TRANSPORTATION INFRASTRUCTURE

STEP	STATUS	PROGRESS
Create a program to hire Boston non-profits and residents to implement outreach processes for walking and bicycling projects and to co-create neighborhood priorities for walking and bicycling improvements	NOT STARTED	
Deepen partnerships between City agencies to ensure equitable outcomes from transportation investments	IN PROGRESS	Transportation regularly collaborates with other City agencies to understand tools and strategies to enable more equitable outcomes.
Develop relevant materials in commonly-used languages to ensure that all residents are informed about projects and are able to participate	IN PROGRESS	Transportation regularly translates outreach and meeting materials for its projects, for example the fact sheet for Connect Downtown .
Continue to expand incentives and accessibility initiatives around bike riding, particularly for young people	IN PROGRESS	Transportation is planning remote and online events to engage residents over the summer. We hope to re-launch the Youth Cycling Program within the year.

10. ENCOURAGE MODE SHIFT THROUGH TRANSPORTATION DEMAND MANAGEMENT (TDM) AND SUSTAINABLE PARKING POLICIES

STEP	STATUS	PROGRESS
1. Complete inventory of the Downtown Parking Freeze (2019)	DELAYED	The Downtown parking freeze inventory is currently undergoing quality control.
2. Release citywide TDM framework and new TAPA guidelines (2020)	IN PROGRESS	Transportation is currently working on a points-based TDM program .
3. Update Downtown, South Boston and East Boston parking freeze regulations (2020)	IN PROGRESS	Draft regulations were approved during the September hearing.
4. Launch an online platform to streamline the TAPA process (2021)	IN PROGRESS	Transportation has contracted with Stantec and Ease Consult to develop a points-based system and online platform.
5. Carry out parking inventories of priority areas and identify neighborhoods for tactical interventions (2020)	IN PROGRESS	Test projects like flexible lanes, pick-up and drop-off areas and mobility hubs are underway .
6. Study transportation impact fee that would be used to improve transportation networks outside of development projects (2022)	NOT STARTED	
7. Evaluate the impact of expanding the parking freeze to additional neighborhoods (2021-2024)	NOT STARTED	
8. Assess additional programs and policies to deter single occupancy vehicles, including residential parking permits, parking cash-out and other commuter incentives (ongoing)	IN PROGRESS	Transportation is developing a new program to fund transit and Blue Bikes passes for employees of Main Streets districts.



11. SUPPORT CITYWIDE ZERO-EMISSION VEHICLE (ZEV) DEPLOYMENT

STEP	STATUS	PROGRESS
1. Convene an internal City working group to help develop and implement a citywide ZEV strategy (starting in 2019, ongoing)	COMPLETE (ongoing)	Transportation , Environment and other City departments met most recently in March.
2. Develop a ZEV Roadmap to accelerate Boston's transition to EVs and other ZEV (starting 2020)	IN PROGRESS	The ZEV Roadmap is being reviewed.
3. Pilot electric vehicle car share as an expansion of Car Share Boston and in partnership with community organizations (starting 2020)	NOT STARTED	MassCEC awarded E4theFuture (lead), the City and other partners a grant for an EV car share pilot in Roxbury.
4. Install electric vehicle charging on 6 municipally-owned parking lots through the Eversource Make Ready program (by 2020)	IN PROGRESS	After delays due to the coronavirus construction ban, installation is now in progress (see locations).
5. Release how-to guides for installing EV chargers targeted at landlords, employers and residents (by 2020)	COMPLETE	Recharge Boston , our EV resources page, includes guides for workplaces and residential buildings .
6. Incorporate ZEV strategies into Boston's travel demand management (TDM) programs (2020)	IN PROGRESS	Transportation is developing a "points-based" TDM program.
7. Work with dealerships and other partners to highlight availability of ZEVs (ongoing)	NOT STARTED	
8. Encourage uptake of electric vehicles in private fleets and third-party carshare systems, including through the TAPA process (ongoing)	IN PROGRESS	The EV Readiness Policy awards points for car share. Transportation is updating TAPA guidelines.
9. Consider additional transportation options through the permitting of shared micromobility such as e-scooters and e-bikes (starting 2020)	NOT STARTED	The Small Vehicle Sharing Business Advisory Group meets monthly per the micro mobility ordinance .
10. Study equipment replacement strategies for older or highly-polluting vehicles, including developing a used EV market (ongoing)	NOT STARTED	

12. ACCELERATE MUNICIPAL FLEET TRANSITION TO ZERO- AND LOW-EMISSION VEHICLES

STEP	STATUS	PROGRESS
1. Convene a quarterly internal City Working Group to coordinate fleet management and citywide ZEV strategy (starting in 2019)	COMPLETE (ongoing)	Public Works , Transportation , Budget , Environment and fleet managers recently discussed FY21 purchasing.
2. Develop a vehicle replacement plan to convert the Central Fleet to 100 percent zero- and low-emission vehicles (2020)	IN PROGRESS	The City has received support from the Bloomberg American Cities Climate Challenge to evaluate options.
3. Develop a plan and timeline to deploy electric vehicle charging infrastructure across municipal facilities and lots (2020)	IN PROGRESS	The City has received support from the Bloomberg American Cities Climate Challenge to evaluate options.
4. Pilot electric, renewable diesel, and other carbon-neutral technologies for heavy fleet vehicle replacement (starting 2021)	NOT STARTED	
5. Develop vehicle replacement plans for non-Central Fleet vehicles (2020-2023)	NOT STARTED	



13. IMPLEMENT AND EXPAND COMMUNITY CHOICE ENERGY

STEP	STATUS	PROGRESS
1. Launch CCE program, pending approval of Boston's plan by the Department of Public Utilities (2020)	IN PROGRESS	We received a final approval order from the Massachusetts Department of Public Utilities in August.
2. Implement an opt-up engagement program in partnership with community organizations (starting 2020)	IN PROGRESS	Staff have been developing consumer protection campaigns in addition to CCE engagement.
3. Evaluate development of a municipal ratepayer-funded energy efficiency incentive program (starting 2020)	NOT STARTED	
4. Develop a plan to carry out direct investment in renewables through CCE (2020-2022)	NOT STARTED	
5. Use data collected through the CCE program to find opportunities to support energy efficiency programs (starting 2021)	NOT STARTED	

14. PLAN FOR THE DEPLOYMENT OF CARBON-NEUTRAL DISTRICT ENERGY MICROGRID SYSTEMS

STEP	STATUS	PROGRESS
Continue to align the Smart Utilities Policy with carbon neutrality goals by emphasizing carbon-neutral district energy systems using renewable and all-electric sources	IN PROGRESS	The Smart Utilities Policy was launched as a two-year pilot in 2018. BPDA is assessing potential additional technologies.
Develop a strategy to prioritize where, if at all, natural gas-based systems would still be needed in the future, including hospitals	IN PROGRESS	We are monitoring the Attorney General's request to the DPU to open a general investigation of the future of natural gas in the Commonwealth.

15. SUPPORT STATE POLICIES AND PROGRAMS THAT FURTHER DECARBONIZE THE REGION'S AND BOSTON'S ENERGY SUPPLY

STEP	STATUS	PROGRESS
Support a 100 percent clean grid in the state's net-zero study and plans, and support policies and incentive programs for expanded energy storage, solar and wind generation, and other distributed energy resources	ONGOING	The City of Boston sits on the Implementation Advisory Committee for the Global Warming Solutions Act.
Support Mass Save programming that encourages systematic fuel-switching away from fuel oil and natural gas to electricity or other clean energy sources.	ONGOING	
Advance Mayor Walsh's 2019 legislative agenda, including an Act to Modernize Our Natural Gas Infrastructure	ONGOING	See Bill H.2828.
Support investments in facilities that serve low-income communities during grid outages under the Clean Peak Standard	NOT STARTED	



16. DECARBONIZE THE CONSUMPTION OF BOSTON RESIDENTS AND BUSINESSES

STEP	STATUS	PROGRESS
Conduct a consumption-based emissions inventory	NOT STARTED	
Promote sustainable consumption and help the public shift to goods and services with lower emissions	IN PROGRESS	Greenovate maintains the Climate Action Guide , a list of steps residents can take to reduce their impact.
Explore embodied carbon and actions to increase material reuse and use of carbon-sequestering materials	IN PROGRESS	Zero Waste and Landmarks Commission are studying material preservation and deconstruction.
Encourage land use and economic development policies that support neighborhood retail and Boston-based startups, to build a local, circular economy that allows residents to meet all of their basic needs close to home and to live car-free.	NOT STARTED	

17. GREEN MUNICIPAL INVESTMENTS

STEP	STATUS	PROGRESS
Monitor the performance of the ESG Investment Initiative	NOT STARTED	
Update our guidelines for environmentally preferable procurement (EPP), also sometimes called “green purchasing”	IN PROGRESS	Zero Waste is evaluating options to update Boston’s EPP guidelines.
Explore incorporating ESG principles into management of the City of Boston pension and trust funds	NOT STARTED	

18. DEVELOP A VALUES-BASED FRAMEWORK FOR CARBON OFFSETS

STEP	STATUS	PROGRESS
Develop guidelines for carbon offsets for future City policies and programs	IN PROGRESS	Carbon offsets are being studied in the context of Strategy #5.
Explore a local carbon offsets market in partnership with neighboring municipalities and regional partners	NOT STARTED	
Evaluate the role of urban forestry and resilience benefits of local carbon offsets	NOT STARTED	



3. PREPARING FOR CLIMATE CHANGE

I. CLIMATE READY BOSTON

This section identifies our progress in putting in place the 5 layers, 11 strategies, and 39 initiatives recommended in the Climate Ready Boston Outline of Actions.

LAYER 1: UPDATED CLIMATE PROJECTIONS

Strategy 1: Maintain up-to-date projections of future climate conditions to inform adaptation.

INITIATIVE	STATUS	PROGRESS
1.1: Launch the Greater Boston Panel on Climate Change and require periodic updating of Boston-specific climate projections.	IN PROGRESS	The Boston Research Advisory Group (BRAG) is currently updating projections as part of a metro Boston regional project for the MAPC .
1.2: Create updated local flood maps to support planning, policy, and regulation.	COMPLETE	The Boston Planning & Development Agency (BPDA) released the updated Climate Change Resilience and Preparedness Checklist with a Flood Hazard Area Map .

LAYER 2: PREPARED AND CONNECTED COMMUNITIES

Strategy 2: Expand education and engagement of Bostonians on climate hazards and action.

INITIATIVE	STATUS	PROGRESS
2.1: Expand Citywide Climate Readiness Education and Engagement campaign.	IN PROGRESS	Greenovate Boston completed the fifth cohort of the Leaders Program.
2.2: Launch a Climate Ready Buildings Education Program for property owners and users.	IN PROGRESS	Environment has begun initial planning to develop the program.
2.3: Conduct an outreach campaign to facilities that serve vulnerable populations to support preparedness and adaptation.	IN PROGRESS	Environment is developing targeted outreach and education strategies to increase heat resilience awareness.
2.4: Update the City's heat emergency action plan.	IN PROGRESS	In 2018, the Boston Public Health Commission led development of a citywide public health action plan for extreme temperatures. In 2020, Environment was awarded a Massachusetts Municipal Vulnerability Program (MVP) grant for a heat resilience planning study.
2.5: Expand Boston's Small Business Preparedness Program.	NOT STARTED	



Strategy 3: Leverage climate adaptation as a tool for economic development.

INITIATIVE	STATUS	PROGRESS
3.1: Identify resilience focused workforce development pathways.	NOT STARTED	
3.2: Pursue inclusive hiring and living wages for resilience projects.	IN PROGRESS	The Boston Jobs and Living Wage Ordinance applies to service contracts with the City valued at or above \$25,000 with companies that employ at least 25 full-time employees.
3.3: Prioritize use of minority-and-women-owned businesses for resilience projects.	IN PROGRESS	Mayor Walsh issued a 2016 Executive Order to ensure that minority and women entrepreneurs are afforded fair and equitable opportunities when competing for City contracts.

LAYER 3: PROTECTED SHORES

Strategy 4: Develop local climate resilience plans to coordinate adaptation efforts.

INITIATIVE	STATUS	PROGRESS
4.1: Develop local climate resilience plans in vulnerable areas to support district-scale climate adaptation.	IN PROGRESS	The Downtown and Dorchester plans, led by the Environment Department, will be completed in 2020 and plans for Phase II of East Boston and Charlestown will begin in 2020. The Moakley Park Vision Plan , led by The Parks Department (Parks) , is complete.
4.2: Establish local climate resilience committees to serve as long-term community partners for climate adaptation.	ONGOING	Greenovate Boston is continuing community education programs through Greenovate Leaders, Greenovate Ambassadors, the Equity Dialogues, which focuses on creating social and communal resilience.



Strategy 5: Create a coastal protection system.

INITIATIVE	STATUS	PROGRESS
5.1: Establish Flood Resiliency Overlay District and require potential integration with flood protection.	IN PROGRESS	The BPDA Flood Resiliency Building Guidelines have been released and a proposed recommendation for the flood resilience overlay district is being developed.
5.2: Determine a consistent evaluation framework for flood defense prioritization.	IN PROGRESS	Environment maintains a set evaluation criteria that have been used during the Climate Ready East Boston , Charlestown , South Boston , Downtown , and Dorchester plans.
5.3: Prioritize and study the feasibility of district-scale flood protection.	IN PROGRESS	The Downtown and Dorchester plans, coordinated by Environment , in collaboration with BPDA and others, are near completion. Plans for East Boston and Charlestown will begin in summer 2020.
5.4: Conduct a harbor-wide flood protection system feasibility study.	COMPLETE	University of Massachusetts Boston released the “Feasibility of Harbor-wide Barrier Systems” in May 2018, which informed the Resilient Boston Harbor Vision .

LAYER 4: RESILIENT INFRASTRUCTURE

Strategy 6: Coordinate investments to adapt infrastructure to future climate conditions.

INITIATIVE	STATUS	PROGRESS
6.1: Establish an Infrastructure Coordination Committee (ICC).	IN PROGRESS	The City of Boston participates in the Metro-Mayors Resiliency Taskforce, hosted by the Metro Area Planning Council every quarter.
6.2: Continue to collect important asset and hazard data for planning purposes.	ONGOING	The City is participating in a Storm-resilient Infrastructure Assessment led by the Resilient Mystic Collaborative with other Lower Mystic municipalities to understand coastal storm impacts across critical infrastructure in the region.
6.3: Provide guidance on priority evacuation and service road infrastructure to the ICC.	IN PROGRESS	The BPDA, Office of Emergency, and Environment meet regularly to coordinate efforts.



Strategy 7: Develop district-scale energy solutions to increase decentralization and redundancy.

INITIATIVE	STATUS	PROGRESS
7.1: Conduct feasibility studies for community energy solutions.	IN PROGRESS	Through the City of Boston's Smart Utilities Policy , Article 80 development promotes utilities that are easier to build, maintain and upgrade and hardens infrastructure against flooding and heat waves. Feasibility of energy solutions is considered throughout this process.

Strategy 8: Expand the use of green infrastructure and other natural systems to manage stormwater, mitigate heat, and provide additional benefits.

INITIATIVE	STATUS	PROGRESS
8.1: Develop a green infrastructure location plan for public land and rights-of-way.	IN PROGRESS	Parks completed a design and implementation guide for green infrastructure. Boston Water and Sewer Commission (BWSC) is finalizing conceptual designs and cost estimates of green infrastructure in Boston's tributary areas.
8.2: Develop a sustainable operating model for green infrastructure on public land and rights-of-way.	IN PROGRESS	The Green Stormwater Infrastructure working group meets monthly to coordinate green infrastructure planning across departments.
8.3: Evaluation incentives and other tools to support green infrastructure.	IN PROGRESS	The Smart Utilities Policy requires properties over 100,000 square feet under Article 80 Review to retain 1.25" rainfall on impervious areas onsite.
8.4 develop design guidelines for green infrastructure on private property to support co-benefits.	IN PROGRESS	BWSC is creating a design manual for green infrastructure. BPDA Coastal Flood Resilience Design guidelines are complete.
8.5 Develop an action plan to expand Boston's urban tree canopy.	IN PROGRESS	Parks and Recreation is leading the development of an Urban Forestry Plan .
8.6: Prepare outdoor facilities for climate change.	NOT STARTED	
8.7: Conduct a comprehensive wetlands inventory and develop a wetlands protection action plan.	NOT STARTED	



LAYER 5: ADAPTED BUILDINGS

Strategy 9: Update zoning and building regulations to support climate readiness.

INITIATIVE	STATUS	PROGRESS
9.1: Establish a planning flood elevation to support zoning regulations in the future floodplain.	IN PROGRESS	BPDA established a planning flood elevation based on 40 inches of sea level rise to evaluate new projects in the updated Climate Change Resilience and Preparedness Checklist .
9.2: Revise zoning code to support climate ready buildings.	IN PROGRESS	The BPDA is developing a flood resiliency zoning proposal to present to the Zoning Commission.
9.3: Promote climate readiness for projects in the development pipeline.	NOT STARTED	Pending completion of Initiative 9.2.
9.4: Pursue state building code amendments to promote climate readiness.	NOT STARTED	The City has partnered with the Cities of Somerville and Casmbridge to advocate with the Commonwealth's Board of Building Regulation and Standards (BBRS) to advance a net zero carbon stretch code. The BBRS has since begun exploring the creation of a net zero carbon stretch code.
9.5: Incorporate future climate conditions into area plans.	IN PROGRESS	BPDA's Dot Ave , JP/Rox , and Glover's Corner plans include recommendations for climate preparedness and resiliency.

Strategy 10: Retrofit existing buildings.

INITIATIVE	STATUS	PROGRESS
10.1: Establish a Resilience Audit Program for property owners.	NOT STARTED	Helpful resource: Please inquire A Better City for a report on resilient audit program recommendations.
10.2: Prepare municipal facilities for climate change.	IN PROGRESS	The City's insurance company, FM Global, is assessing the flood vulnerability of several high-risk municipal buildings.
10.3: Expand back-up power at private buildings that serve vulnerable populations.	NOT STARTED	Completed in 2016, the Boston Community Energy Study identifies districts that are suitable for community solar projects.
10.4: Develop toolkit of building retrofit financing strategies.	NOT STARTED	Helpful resource: UMass Boston released a report in April 2018, " Financing Climate Resilience ".



Strategy 11: Insure buildings against flood damage.

INITIATIVE	STATUS	PROGRESS
11.1: Evaluate the current flood insurance landscape in Boston.	IN PROGRESS	Evaluation to be conducted as part of the City of Boston's Community Assistance Visit with FEMA.
11.2: Join the NFIP Community Rating System.	IN PROGRESS	The Community Assistance Visit , which is a prerequisite to the Community Rating System is underway with FEMA.
11.3: Advocate for reform in the National Flood Insurance Program.	NOT STARTED	

II. NEIGHBORHOOD COASTAL RESILIENCE PLANS

We can protect our coastal communities from sea level rise and storms by creating resilient, accessible open spaces, and prepared buildings and infrastructure. The Resilient Boston Harbor Vision lays out strategies along Boston's 47-mile shoreline that will increase access and open space along the waterfront while providing protection for the City. To achieve this, the City focuses neighborhood scale coastal resilience planning in Boston's most vulnerable flood pathways, identified by Climate Ready Boston flood maps.

INITIATIVE	STATUS	PROGRESS
East Boston and Charlestown	IN PROGRESS	Phase I of coastal resilience planning was completed and report released in 2017. Phase II will begin summer 2020.
Downtown and North End	IN PROGRESS	Planning process is complete. The report is in development and will be released in 2020.
South Boston	COMPLETE	Report released in 2018.
Dorchester Waterfront	IN PROGRESS	Planning process is complete. The report is in development and will be released in 2020.



4. BECOMING A ZERO-WASTE COMMUNITY

I. BY THE NUMBERS

Boston Residential Municipal Solid Waste (MSW) Tonnage

Fiscal Year	Trash	Recycling	Yard Waste	Project Oscar
2020	194,228	42,953	9,050	120
2019	190,459	41,370	9,290	104
2018	190,901	41,209	9,080	99

Note: Project Oscar is Boston's 24-hour community compost pilot program.

II. ZERO WASTE BOSTON

Released in June 2019, [Zero Waste Boston](#) is Boston's plan to become a zero-waste community. The plan details 30 short- and long-term strategies to increase diversion from 25 percent in 2018 to at least 80 percent by 2035.

REDUCE AND REUSE

STEP	STATUS	PROGRESS
Short-term strategies to advance		
1. Conduct citywide public education campaigns	ONGOING	Public Works mailed Boston Trash and Recycling Guides , and made them available online. The " Boston Trash App " allows residents to view their collection schedule, search recyclable materials, and more.
2. Provide targeted waste-reduction outreach and technical assistance	ONGOING	In partnership with RecyclingWorks MA, Zero Waste published " Business Waste Reduction Toolkits ", and is distributing a "Waste Reduction for Businesses" resource card with Inspectional Services .
3. Reduce problem products & packaging	ONGOING	In October 2019, the City submitted testimony supporting 3 state bills related to Extended Producer Responsibility.
4. Divert more reusable goods	IN PROGRESS	We released an RFP in July 2019 for curbside textile pickup; proposals under review.
Long-term strategies to advance		
5. Divert even more reusable goods	NOT STARTED	
6. Keep repairable products from disposal	IN PROGRESS	In collaboration with Fix-it Clinic and Boston Public Library (BPL), will be hosting a



		fall Fix-it Clinics. In 2019, the City testified in favor of state right-to-repair legislation.
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INCREASE COMPOSTING

STEP	STATUS	PROGRESS
Short-term strategies to advance		
7. Expand residential yard waste options	ONGOING	Public Works expanded residential yard waste collection to 20 weeks and added a drop-off day.
8. Pilot programs to handle residential food scraps	IN PROGRESS	Continued Project Oscar food waste drop-off program, improved infrastructure and service at all five locations. Request for Proposal went out in July 2019 for curbside food waste collection program; proposals under review.
9. Expand commercial composting	NOT STARTED	
10. Increase compost capacity	IN PROGRESS	Request for Information went out in August 2019 for how to manage compost for the city; responses under review.
Long-term strategies to advance		
11. Take residential composting programs to scale	NOT STARTED	
12. Increase commercial composting even more	NOT STARTED	

RECYCLE MORE AND RECYCLE RIGHT

STEP	STATUS	PROGRESS
Short-term strategies to advance		
13. Educate boston residents, businesses and visitors to recycle correctly	ONGOING	Increasing social media posts and Twitter and Facebook accounts, including establishing “#ZeroWasteWednesdays” to highlight zero waste efforts. Launched Recycle Right campaign, to increase recycling literacy and reduce recycling contamination.
14. Expand and enforce state and local waste reduction and recycling requirements	NOT STARTED	
15. Reinforce waste-reduction goals through the collection system	NOT STARTED	
16. Create new commercial hauler and generator rules	IN PROGRESS	In 2020, Public Works expanded commercial trash hauler permits to include all waste hauler. This helps commercial waste data collection.
17. Lead by example at public facilities	IN PROGRESS	Developing a pilot program to implement food waste at 3 schools.



18. Expand recycling during construction projects	IN PROGRESS	Initial, informational conversations with various stakeholders on deconstruction and construction/demolition waste.
19. Increase transparency about costs	NOT STARTED	
20. Expand infrastructure for recycling “hard to recycle” materials	NOT STARTED	
21. Require zero waste strategies for public events	IN PROGRESS	Published a “Zero Waste Event Checklist”, available online.
Long-term strategies to advance		
22. Create a more equitable collection system	NOT STARTED	

INSPIRE INNOVATION

STEP	STATUS	PROGRESS
Short-term strategies to advance		
23. Expand the city’s environmentally preferable purchasing practices	IN PROGRESS	Ongoing collaboration with City of Boston Procurement Department
24. Set zero waste reduction goals and metrics	NOT STARTED	
25. Advocate for redesign and take-back of products	NOT STARTED	
26. Support green jobs	ONGOING	Providing technical assistance and supporting waste reduction initiatives
27. Create a zero waste economic development strategy	IN PROGRESS	Developing zero waste economic development team in collaboration with the City of Boston Economic Development Department
Long-term strategies to advance		
28. Fund new ideas and approaches	NOT STARTED	
29. Support a zero waste research and development network	NOT STARTED	
30. Explore the feasibility of city-owned trash and recycling infrastructure	NOT STARTED	



5. ENGAGING THE COMMUNITY TO ACT ON CLIMATE

The City of Boston Environment Department regularly reaches out and engages with residents across Boston neighborhoods, building connections and community for climate action and policy-making. Our teams organize events and training for residents to take direct action to preserve our local environment, join community group meetings, and host events for climate planning and policy-making. We've shared some noteworthy stories and initiatives below.

I. ZERO WASTE EVENTS

In order to reach our goal of becoming a zero waste community, every Bostonian needs to reduce, reuse, recycle and compost.

The City of Boston Publics Works and Environment Departments have hosted several awareness-raising and recycling events. These include [household hazardous waste drop-offs](#), where Boston residents can safely dispose of hazardous waste, shred paper documents, and recycle electronics, textiles and clothing for free. We offer at least 5 drop-offs per year.

Our team members also attended over 23 public meetings and events over the course of the past year.

Pictured right: Victoria Phillips, Zero Waste Coordinator, shows attendees of the Climate Action Youth Conference how to upcycle an old t-shirt into a reusable cloth bag at the Boston Nature Center.



II. GREENOVATE BOSTON

Greenovate Boston is the City's program to get all Bostonians involved in addressing climate change. We seek to empower residents to carry out actions in their communities that align with our climate action, resilience, and mitigation goals.

LEADERS AND AMBASSADORS

The Greenovate Boston Leaders Program is an outreach program, aiming to increase awareness and understanding of the climate impacts Boston faces. We have trained 230+ Greenovate Leaders in 6 cohorts. This program educates community members about the City's efforts to address climate change and empowers them to lead discussions in their own communities. The Leaders receive knowledge and support to apply their passion for climate action to educational outreach. Each of the 230+ Greenovate

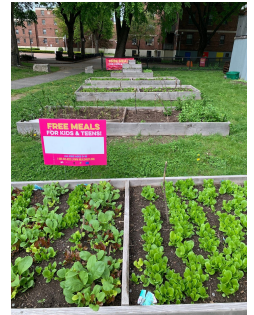


Leaders extend climate action information in new ways, like setting up events in City neighborhoods with Greenovate’s support.

Greenovate skills in the workplace



“As an architect, I am passionate about how the built environment can solve climate change, rather than exacerbate it. Being a Greenovate Leader has provided useful tools to help me communicate the importance of climate change and adaptation strategies to stakeholders on the projects I am working on. I give regular presentations on climate change and adaptability, most valuing the Climate Ready Boston Map Explorer GIS tool. This equips my team and I, early in our design process, with data we can leverage to understand and explain to our clients what will be the most driving risks and the consequential beneficial and economic long-term strategies to overcome



them.”

- Blake Jackson, 39, South Boston

Greenovate starts effective conversations

“At lunch time, I went to get water with my Greenovate bottle and one of my colleagues asked me about the name and then we started talking about climate change, the zero waste campaign, and the problem of plastic contamination. A few days later I saw him again and he showed me how his workplace transitioned from plastic to reusable utensils. It was amazing to see how we can spread our voice and action.



I was also able to present in my native language in East Boston about how climate change will affect our community and how we can prepare for it.”

- Ruth Nieves, 50, Dorchester

Applying Greenovate to the needs of your community

“I am passionate about open green space and urban agriculture. The Greenovate Leaders program provided a community to work and learn from like minded people. Since then, I have continued to create dialogue on the importance of climate change, sea level rise, and gardening. We created a community garden that teaches urban agriculture to children. We are creating a model to increase food access in Boston.”

- George Benner, 50, Dorchester



Making climate change education creative

“I am most passionate about how recycling can impact our climate. I wrote a children’s book about what I learned from the Greenovate program. I’ve gone to some elementary schools in Boston and shared it with the kids.”

- Amanda Smart, 41, Brighton



URBAN WILD CLEAN UPS

Urban Wild Clean Ups are an opportunity to get involved with climate action in Boston. Our Urban Wilds are an essential part of the City's open space system. They help mitigate the adverse impacts of climate change. Keeping our open spaces clean in partnership with the Parks and Recreation Department allows constituents to get to know their neighborhood and build more resilient communities.

We've collectively contributed over 300 hours of volunteer work alongside 100+ volunteers, in different Boston Urban Wilds. The clean-ups have improved our green space's cleanliness and accessibility to surrounding communities, including Allandale Woods, Belle Isle Marsh, Gladeside, Rivermoor, Bussey Brook, Sherrin Woods, and more.

Each clean up works to restore the natural environment of the Urban Wild. Volunteers extract litter ranging from plastic bottles and bags to wooden panels, car parts, and lawn furniture. Volunteers collected hundreds of pounds of improperly discarded litter that invaded our natural habitats. This program will continue to allow for volunteers to connect with and rehabilitate Boston's wild spaces.



EQUITY DIALOGUES

Climate change affects all Bostonians, but it does not affect everyone equally. Climate change disproportionately impacts socially vulnerable populations. These populations include:

- older adults
- youth
- people of color
- women
- people with disabilities (mobility, cognitive, sensory), and
- citizens experiencing homelessness.

The Equity Dialogues discuss the intersection between social equity and climate change. We cannot work towards social equity without taking multi-faceted, inclusive, and comprehensive steps to lessen the impacts of climate change. Conversely, we cannot successfully lessen the impacts of climate change without the inclusion and empowerment of socially vulnerable groups.



We have hosted 60+ constituents in four equity dialogues, addressing gender and racial inequality. We developed six presentations and scripts for the different identified vulnerable populations and their relationship to climate change. These dialogues provide an open space for necessary discussion and empower residents to facilitate conversations in their own communities. As a more recent Greenovate development, we have the goal of expanding and utilizing the conversations to inform the City's climate initiatives and foster greater social resilience among Boston's diverse communities.



III. ACCESSIBLE COMMISSION HEARINGS

The Environment Department includes three regulatory commissions:

- Boston Air Pollution Control Commission;
- Boston Conservation Commission;
- Boston Landmarks Commission, and other historic and landmark district commissions.

As a result of the COVID-19 pandemic, Governor Baker issued an executive order suspending certain portions of Open Meeting Law. This rules change allowed the Commissions to rapidly move to online meetings. As a result, members of the public have continued to be able to participate in environmental and preservation review safely and remotely, resulting in record-high participation numbers.

Commission staff are also working towards improving language access in partnership with the Mayor's Office of Language and Communications Access. Per the 2019 Wetlands Protection Ordinance, abutter notices for projects to be reviewed in Conservation Commission hearings will soon be sent in English and the second most spoken language. The Conservation Commission also recently offered simultaneous interpretation in Mandarin at a recent meeting for a project located in Charlestown.

ACKNOWLEDGMENTS

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APPENDICES

This section includes:

- City of Boston 2005-2018 Greenhouse Gas Inventory;
- Highlights from Boston's Previous Climate Action Plans.



B CITY OF BOSTON GREENHOUSE GAS EMISSIONS INVENTORY 2005-2018

OVERVIEW

In 2018, the Boston community emitted 6.4 million metric tons of greenhouse gases (GHGs) from energy use in buildings and transportation. This is nearly a 4% increase from 2017, when Boston emitted 6.1 million metric tons.¹ This increase is due to higher electricity and natural gas use, and a 9% jump in vehicle miles traveled year-over-year. Overall, Boston's 2018 emissions represent a 20% reduction from 2005 with renewable energy credits (RECs), and a 19% reduction without RECs.

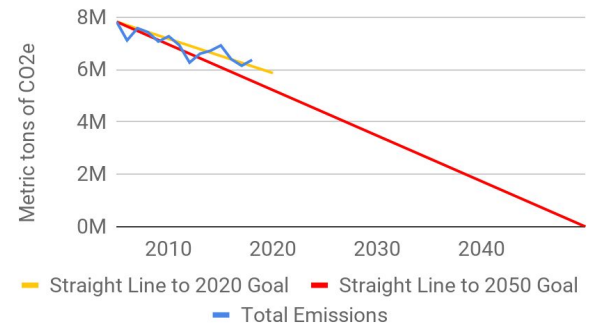
Local government operations emitted 138 thousand metric tons of GHGs, a 37% reduction from 2005 with RECs, and a 30% reduction without RECs. The City of Boston met its 2020 goal of cutting municipal emissions 25% below 2005 levels in 2015 five years ahead of schedule.

Greenhouse gas inventory datasets are available at:
<https://data.boston.gov/dataset/greenhouse-gas-emissions>

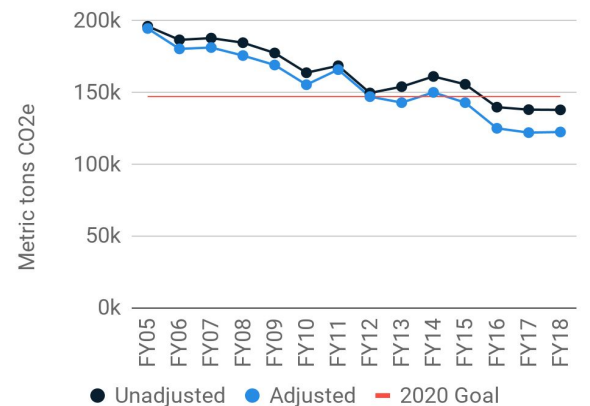
ECONOMIC & POPULATION GROWTH

The reduction in Boston's emissions has occurred at the same time that the population and the number of jobs in Boston have increased. The Boston community has grown from 520 thousand residents in 2015 to more than 696 thousand in 2018.² Emissions per resident over the same time period have decreased 39%, from 15 to 9 metric tons per year. Boston's economic growth, as measured by Gross City Product (GCP), has increased from 106 billion dollars to 129 billion.³ Emissions per million dollars of GCP have decreased

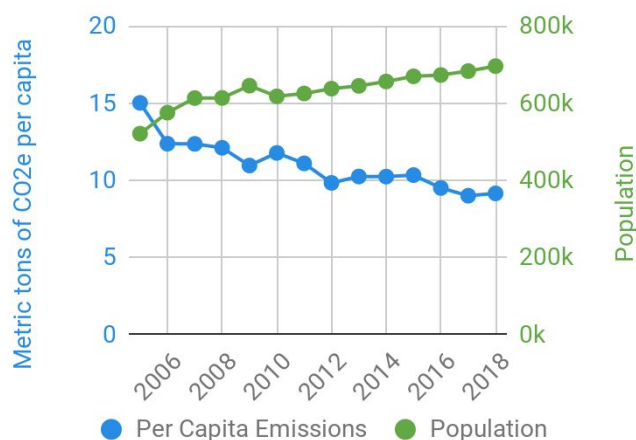
COMMUNITY-WIDE EMISSIONS



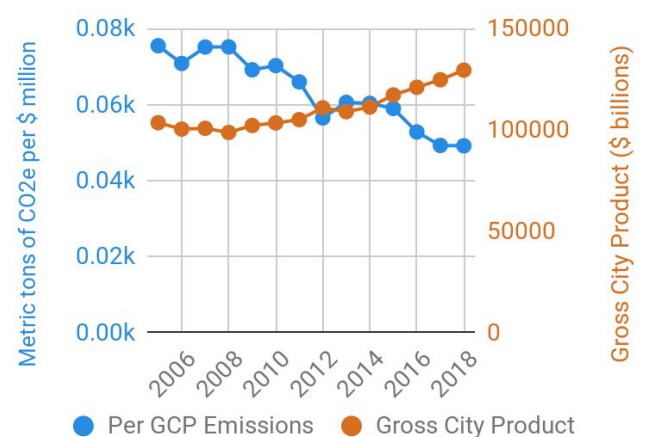
LOCAL GOVERNMENT OPERATION EMISSIONS



BOSTON EMISSIONS PER CAPITA



BOSTON EMISSIONS PER GROSS CITY PRODUCT






35%, from 76 to 49 metric tons per million dollars.



BACKGROUND

In his 2017 State of the City address, Mayor Martin J. Walsh announced the City’s goal of carbon neutrality by 2050.⁴ This commitment underpins the City’s 2019 Climate Action Plan Update, released in October 2019.⁵ To measure progress, Boston follows the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC).⁶ The baseline year is 2005, the first year in which consistent and reliable data was collected. Boston has interim goals to reduce citywide emissions by 25% by 2020 and by 50% by 2030.

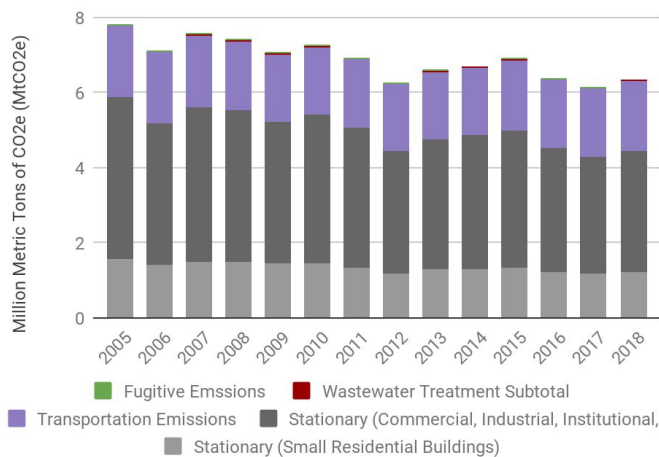
The annual GHG inventory is based on a combination of direct data and estimates for data that cannot be obtained directly (see box below). Data sources include City records, utility company reports, and information from state and federal agencies. Reporting is separated into community-wide and local government operations inventories. Because the data for these inventories is collected using separate protocols on separate timescales, the Local Government Operations Inventory should be considered to be overlapping, but not completely contained within the Citywide Inventory. Detailed notes on inventory methodologies can be found in Appendix I.

<p>WHAT'S INCLUDED?</p>	 <p>Energy used by buildings and other stationary sources; fugitive emissions from natural gas distribution within Boston limits</p>	 <p>On-road and some off-road transportation, and public transportation trips within city limits.</p>	 <p>Wastewater treatment within city limits.</p>
<p>WHAT'S NOT?</p>	<p>Emissions generated outside the city boundary to produce goods or services used by residents (for example, emissions from food produced elsewhere but consumed by Bostonians). Boston will continue to evaluate the benefits and challenges of “consumption-based” emissions accounting as a complement to the current inventory methodology.</p>		

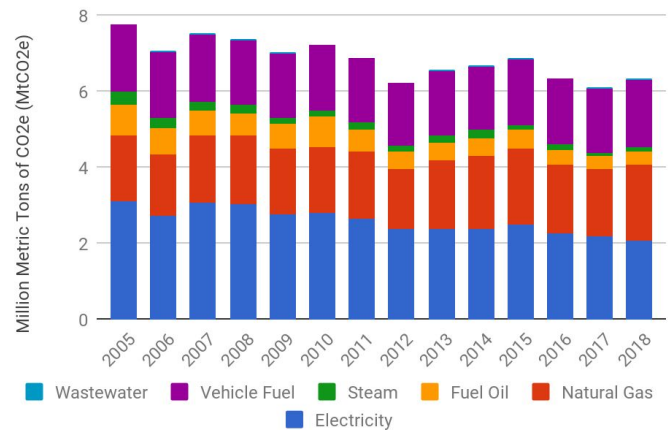
EMISSIONS BY SECTOR & SOURCE

This report contains details of GHG emissions from 2005 to 2018 by energy source and sector. GHG levels reflect both the quantity of energy used and the source of that energy.

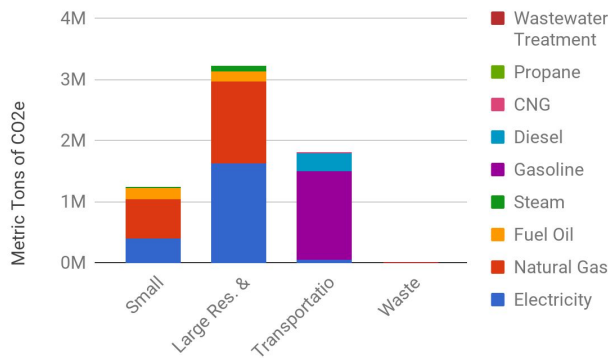
BOSTON EMISSIONS BY SECTOR



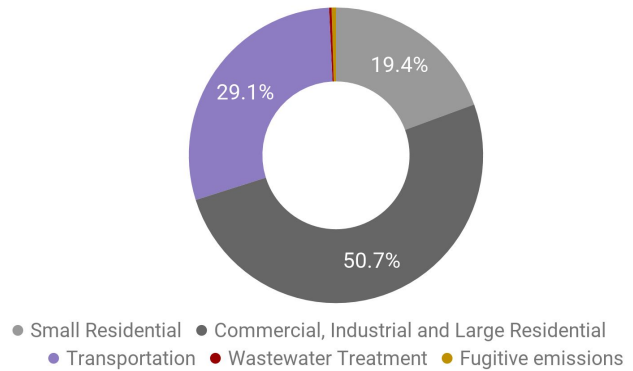
BOSTON EMISSIONS BY SOURCE



2018 GHG Emissions by Sector



2018 EMISSIONS BY SECTOR



STATIONARY SECTOR

The community inventory tracks stationary sector emissions from:

- Commercial, industrial and large residential buildings, including high-rise offices, hospitals, universities and research buildings, manufacturing, and construction,
- Small residential buildings,
- Fugitive emissions from oil and natural gas systems.

In Boston, energy use in stationary sources dominates, accounting for 70% of total emissions (4.5 MtCO₂e). Commercial, industrial, and large residential buildings generated 51% of emissions (3.2 MtCO₂e), while small residential buildings accounted for 19% of emissions (1.2 MtCO₂e). Fugitive gas emissions for all sectors account for less than 1% (31 thousand tCO₂e) of emissions. Emissions in the building sector stem from the use of electricity (46%), natural gas (44%), fuel oil (8%), and steam (2%).

All buildings over 35,000 square feet publicly report their energy and water usage annually. Data is available at: <https://data.boston.gov/dataset/building-energy-reporting-and-disclosure-ordinance>

TRANSPORTATION

Emissions from transportation comprise 29% of the inventory (1.9 MtCO₂e). This is lower than transportation's share of statewide or national emissions because of Boston's density and robust public transportation system. More than half of Bostonians get to work via a mode other than a car.⁷

The inventory captures the emissions from the estimated Vehicle Miles Traveled (VMT) inside the City, plus public transportation vehicles and off-road vehicles used at the airport and wastewater treatment plant. Primary sources of energy in transportation include gasoline (77%), diesel (20%), natural gas (2%), electricity (2%), biodiesel and propane combined (<1%).

WASTE

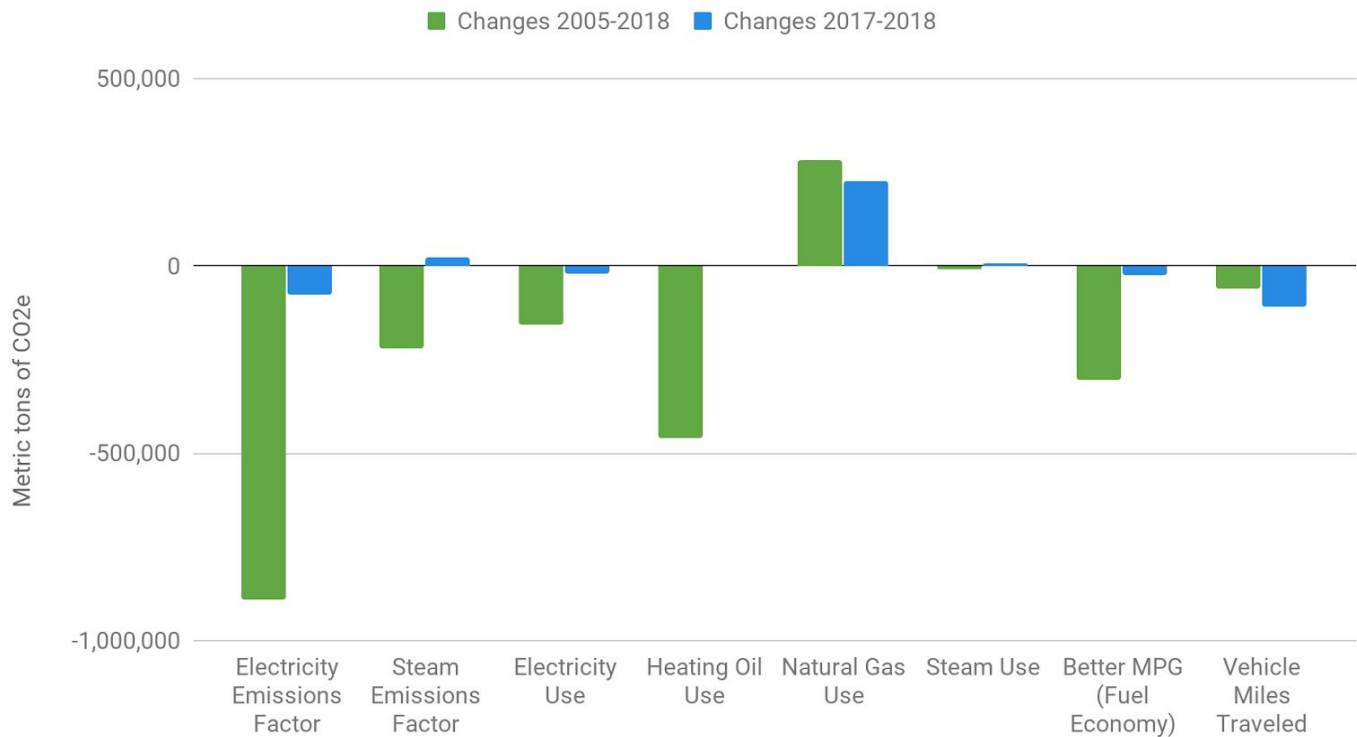
GHGs reported in the waste sector refer to emissions from wastewater treatment and biological treatment of organic waste and account for less than 1% of total emissions (18 thousand tCO₂e). All, or almost all, of Boston's solid waste is sent to Waste-To-Energy (WTE) incineration plants that feed the electricity grid, so emissions are counted as part of regional electricity generation within this inventory. This means solid waste emissions are embedded in the emissions from electricity used in buildings and transportation.

The Carbon Free Boston analysis estimated that Boston's waste sector accounted 393 thousand tons of direct carbon emissions in 2017, if the WTE emissions are broken out from the electricity emissions factor.⁸ The Zero Waste Boston initiative has issued strategies to reduce, reuse, recycle and compost at least 80 to 90 percent of Boston's solid waste.⁹ The Carbon Free Boston analysis determined that a 90 percent diversion rate would reduce waste emissions by 78% relative to 2017 emissions, including the WTE emissions.



FACTORS DRIVING THE CHANGES

WHERE OUR CHANGES COME FROM

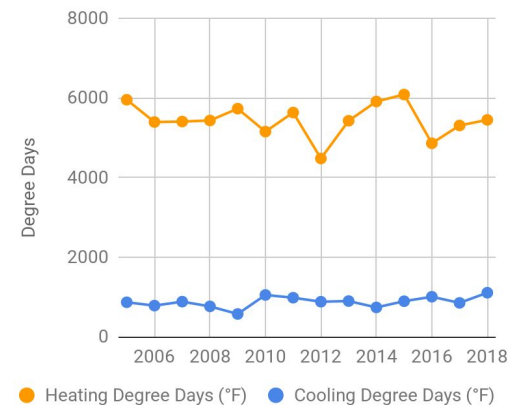


Short-term changes

In 2018, the community's GHG emissions increased nearly 4% (221 thousand tCO2e) from the previous year. These increases reflect that:

- Boston businesses and institutions consumed less electricity and Boston residents used less fuel oil.
- Regional emissions per unit of electricity decreased by 3.5%. Electricity supplied by the regional grid operator, ISO-New England, was generated using more natural gas (1% increase), and less coal and nuclear (1% increase).^{12,13}
- However, Boston residents, businesses and institutions used 8% more natural gas than in 2017. The 2018-19 winter was slightly cooler than the 2017-18 winter.¹⁰

HEATING AND COOLING DEGREE DAYS



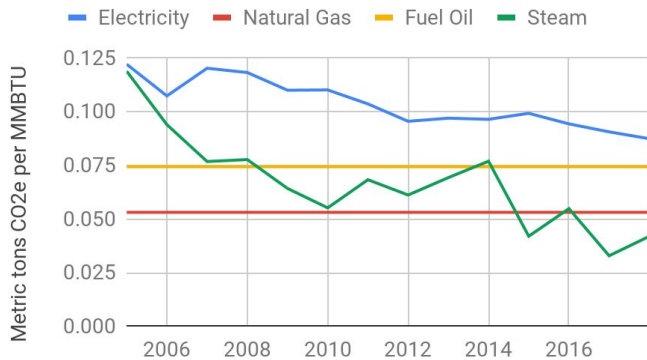
Long-term changes

Boston's GHG emissions from 2005 to 2018 have declined by 19%.

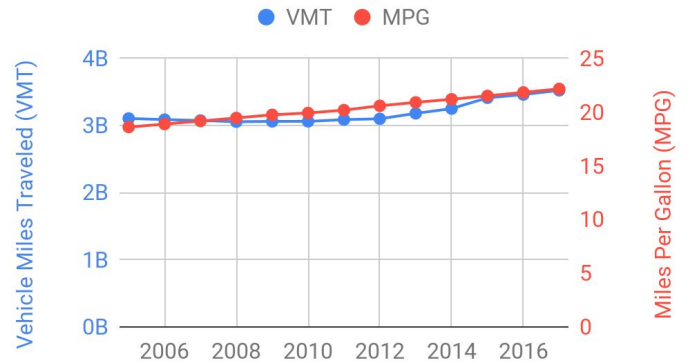
49% of GHG reductions are the result of state-level and regional action to clean the New England electric grid. As a result, the electricity emissions factor has improved continuously over time, as electricity has been less carbon-intensive. Another 25% of GHG reductions may be attributed to reduced fuel oil use. This is because many households and businesses are switching from fuel oil to natural gas to heat their homes. Steam has become cleaner thanks to fuel-switching from oil to natural gas and the addition of the Kendall cogeneration plant in 2014. The average fuel economy of vehicles registered in Boston has also improved from 19.8 miles per gallon (mpg) in 2009 to 21.2 mpg in 2014 (most recent year for which Boston-specific data is available).¹⁴



GREENHOUSE GAS EMISSIONS FACTORS

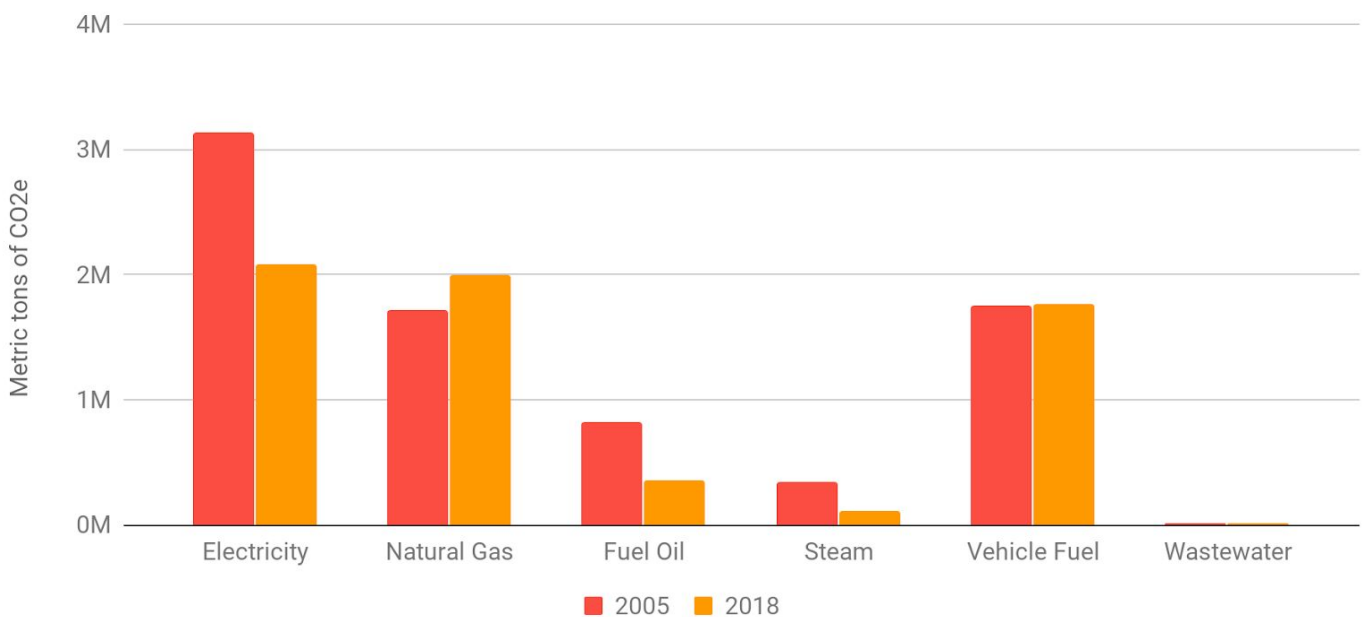


VEHICLE MILES TRAVELED AND FUEL ECONOMY



The energy-efficiency efforts of the Renew Boston program, Boston's utilities, local government and many businesses, institutions, and residents have offset much of Boston's recent growth.

EMISSIONS BY SOURCE IN 2005 AND 2018



UNCERTAINTY

The inventory employs measured data, projections, models, and, where data is scarce, best estimates. All of these sources have some level of uncertainty, most of which have not been quantified. Furthermore, the inventory is frequently revised as new and better data become available, models are improved, new methodology is developed, and international standards evolve.¹⁵ For these reasons, longer term trends are likely more reliable than absolute numbers or year-to-year changes.

LOCAL GOVERNMENT OPERATIONS

BACKGROUND

The Local Government Operations (LGO) inventory calculates all greenhouse gas emissions generated by municipal operations in the City of Boston. This includes the burning of fuels in the City’s facilities, vehicles, and other equipment, and the energy used in municipal buildings, vehicles, parks, street lights, and traffic signals. The LGO inventory is based on the ICLEI greenhouse gas reporting protocol for local government operations.

Under the protocol, emissions that are not under the operational control of the City government or involve leased properties are excluded. Emissions from the Boston Housing Authority, the Massachusetts Water Resources Authority (MWRA), and the Boston Planning and Development Agency (BPDA) are not included in the inventory. Those from the Boston Public Health Commission (BPHC) and the Boston Water and Sewer Commission (BWSC) are included.

While the timeframe for the citywide inventory is the calendar year, the LGO inventory is conducted based on the fiscal year (FY), July-June. Because the data for these inventories is collected using separate protocols and on different timescales, the LGO should be considered to be largely overlapping but not completely contained within the citywide inventory.

OVERALL EMISSIONS

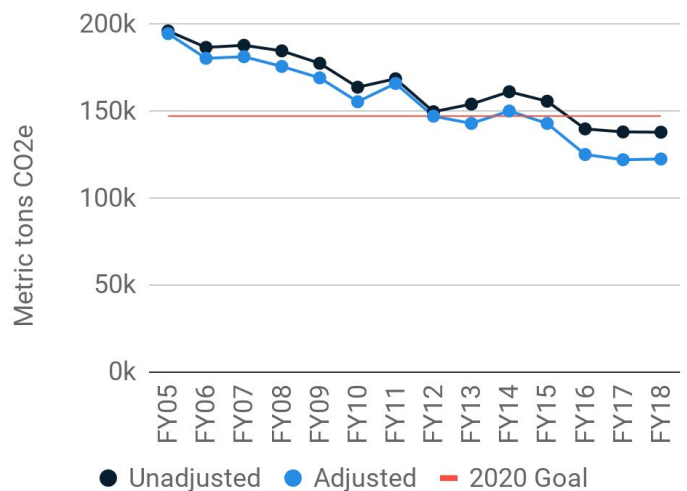
FY18 municipal emissions are down more than 30% from 2005, before including adjustments for the purchase of renewable energy credits. Adjusting for the City of Boston’s purchases of Green-E Certified Renewable Energy Certificates (RECs) equal to approximately one fourth of our total electricity consumption, emissions in FY18 are down nearly 38% from 2005 levels. The City of Boston met its municipal 2020 goal of a 25% reduction 5 years ahead of schedule.

EMISSIONS BY ENERGY SOURCE

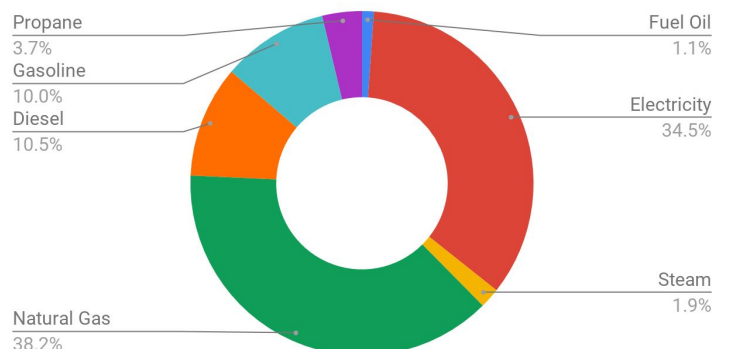
Boston’s LGO emissions are dominated by building energy consumption. Electricity and gas consumption by buildings each make up about one third of total GHG emissions. Transportation fuels, diesel and gasoline, together make up one fourth of total municipal GHG emissions.

Similar to the community-wide inventory, Boston’s municipal operations GHG inventory trends are driven by a number of external and internal factors. Diesel consumption is continuing to decrease as Boston Public Schools switches its fleets from diesel- to propane-powered school buses. The continued downward trend in the regional electric grid emissions rate also contributed to reduced emissions.

LOCAL GOVERNMENT OPERATION EMISSIONS



FY18 LGO EMISSIONS BY SOURCE



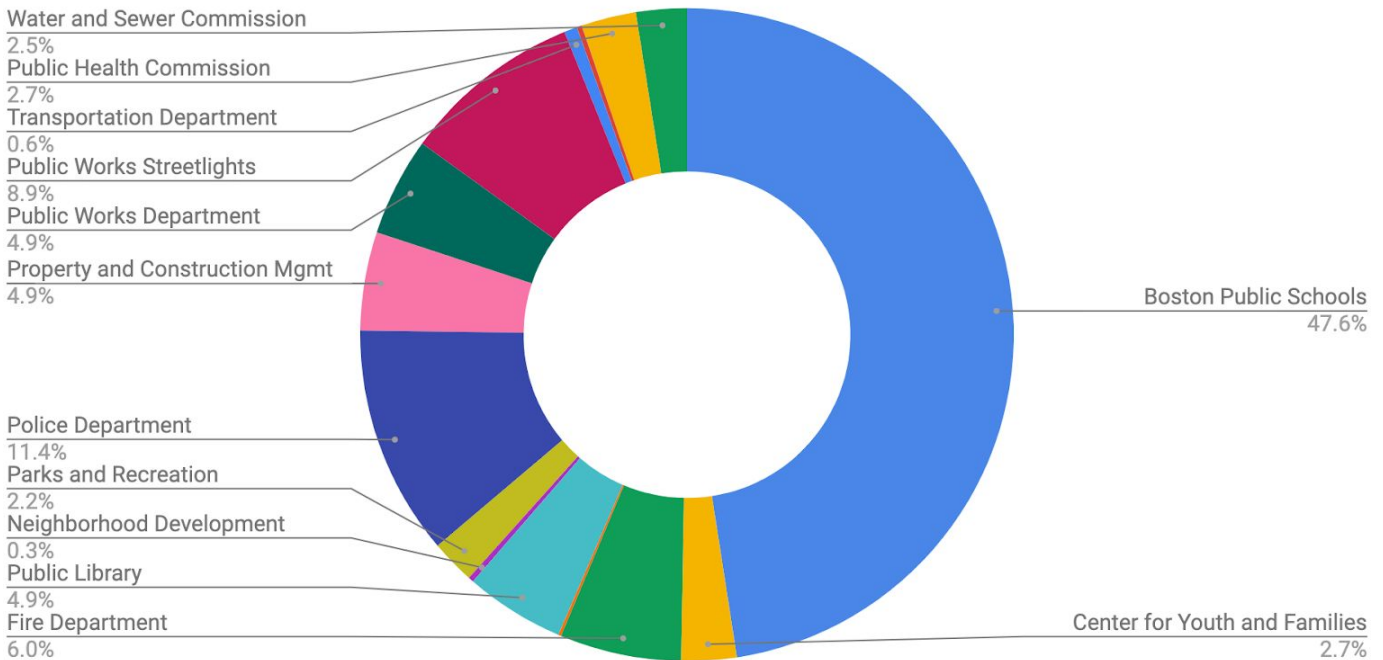
DEPARTMENTAL EMISSIONS

As the department with the largest building portfolio and the second largest vehicle inventory (after Boston Police Department), Boston Public Schools (BPS) represent the largest source of municipal emissions. BPS owns and operates approximately 11 million of the City’s 16.5 million square feet of building space across the roughly 127 school buildings in the district.¹⁶ These buildings represent over a third of municipal electricity consumption and two thirds of municipal gas consumption. The BPS Department of Transportation (DOT) fleet includes over 700 school buses and uses nearly 60% of all the diesel fuel consumed by City government. BPS has continued their replacement of the oldest, dirtiest diesel buses to lower emissions propane engines; propane buses represented a third of the fleet in FY18, and comprise more than half of the fleet in 2020. Since BPS-DOT is on a roughly 10 year replacement cycle, these lower emissions vehicles will provide emissions reductions over the next decade.

The next largest source of GHG emissions from municipal operations is the Boston Police Department (BPD) at about 11.5% of total municipal emissions. In FY18, BPD operated approximately 660,000 square feet of building area and managed a fleet of over 1,000 vehicles. These buildings accounted for 7% of electricity and 5% of natural gas consumed by City of Boston departments. The BPD fleet accounted for roughly 70% of all gasoline consumed by City of Boston vehicles in FY18, marking a roughly 33% increase in greenhouse gas emissions over FY17 BPD fleet emissions associated with gasoline consumption.

The third largest source of GHG emission from municipal operation is the Public Works Department’s street lighting inventory. The 66,000 electric street lights and the 2,800 natural gas street lights (found in Boston’s historic districts) account for 9% of total municipal GHG emissions. Street lighting used to make up a much larger share of Boston’s municipal GHG profile; however, aggressive conversions of electric street lights to LEDs dating back to 2010 have cut emissions from street lights in half. While gas lamps comprise just 4% of total street light fixtures, they produce 37% of GHG emissions from street lights.

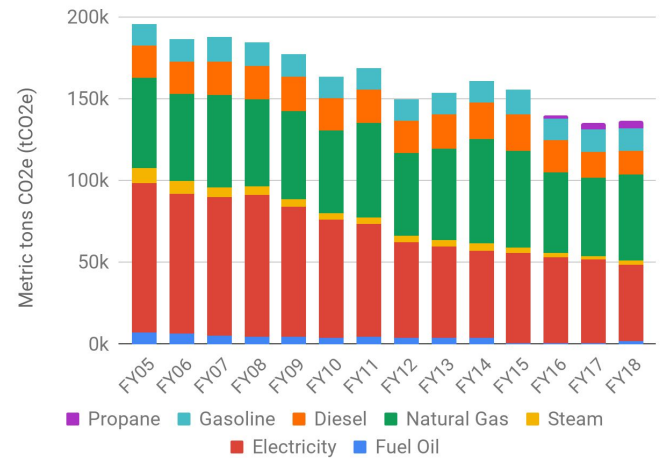
FY2018 MUNICIPAL EMISSIONS BY DEPARTMENT



FACTORS DRIVING THE CHANGES

- The electricity emissions factor decreased as described in the community inventory.
- Emissions from natural gas and fuel oil use have decreased since FY05 as the City converted some older schools from oil to gas, and opened new, energy-efficient buildings that use natural gas for heat and hot water.
- Beginning in FY15, Boston saw a dramatic reduction in fuel oil use due to the closure of the Boston Public Health Commission’s Long Island facility, which relied primarily on fuel oil as a heating source.
- Electricity use has decreased over the long term, primarily driven by the near complete conversion of Boston’s 66,000 electric streetlights to more efficient LED fixtures. Boston has also invested in building energy efficiency measures on a project-by-project basis, and is engaging in deeper energy efficiency retrofits as part of the Renew Boston Trust.¹⁷
- Steam use has decreased over the long term due to the reduction in steam use at City Hall and Copley Library and the conversion of the West End Branch library from steam to gas.
- Boston Public Schools have adopted a policy to transition the bus fleet from diesel to propane, which offers a slight carbon benefit but reduces nitrogen dioxide (NOx) emissions by up to 95% compared to diesel.

LGO EMISSIONS BY SOURCE TYPE (UNADJUSTED)



INVENTORY METHODOLOGY SUMMARY

COMMUNITY INVENTORY PROTOCOL

In 2015, Mayor Walsh signed on to the Global Covenant of Mayors (GCoM), which required the City to follow the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC). ICLEI Local Governments for Sustainability, whose guidance the City already followed, was a co-developer of the GPC, so the differences were not major. The two main changes were in the categories in which the data is collated, and in two new categories of emissions collected. The GPC requires the ethanol content of gasoline to be reported as a separate biogenic source of emissions, and for an accounting of fugitive gas emissions from the natural gas supply system.

Boston’s GHG inventories are reported in CO2 equivalents (or CO2e), a universal unit of measurement that accounts for the global warming potential (GWP) of different greenhouse gases. Boston’s inventory includes carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), and uses Global Warming Potentials (GWPs) from the latest version of the International Panel on Climate Change (IPCC) Guidelines (currently 5AR). The formula used to determine the CO2e from a given energy use is Activity Data x Emissions Factor¹⁺²⁺³ = GHG Emissions from the activity.

Boston currently reports at the GCP BASIC level, which covers scope 1 and scope 2 emissions from stationary and transportation sources, as well as scope 1 and scope 3 emissions from waste.

- Scope 1: GHG emissions from sources located within the city boundary
- Scope 2: GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam, and cooling within the city boundary
- Scope 3: Emissions that occur outside the city boundary as a result of activities taking place within the city boundary



Our full methodology may be found in “Boston Greenhouse Gas Inventory Methodology,” most recently updated for the 2016 inventory year.¹⁸

2018 Data Revisions

- Based on updated guidance from CDP, only approximately 30% of wastewater emissions from the Deer Island Wastewater Treatment Plant are attributed to Boston’s activity; 70% of emissions may be attributed to the activity of other municipalities within the Massachusetts Water Resources Authority’s service area. Wastewater treatment emissions have been updated for all previous years.
- As part of the Building Energy Reporting and Disclosure Ordinance, the first cohort of buildings went through Energy Action and Assessment, a portion of which reporting clean energy purchases in the form of renewable energy certificates (RECs). This new data was used to generate an estimate of total emissions reduction to date accounting for clean energy purchases.

MUNICIPAL INVENTORY METHODOLOGY

The Local Government Operations inventory methodology for calculating GHG emissions is based on the ICLEI greenhouse gas reporting protocol for local government operations, developed by ICLEI and the National Association of Clean Air Agencies. The protocol categorizes emissions as direct (Scope 1) or indirect (Scope 2). Direct emissions come from the burning of natural gas, fuel oil, gasoline, diesel fuel, and other fuels in the City’s facilities, vehicles, and other equipment. Indirect emissions come from the burning of fuels in facilities owned and operated by others to produce electricity, and steam that the City uses. Emissions that are not under the operational control of the City government, or involve leased properties, are excluded. Emissions from the Boston Housing Authority, the Massachusetts Water Resources Authority (MWRA), and the Boston Planning and Development Agency (BPDA) are not included in the inventory. Those from the Boston Public Health Commission (BPHC), and the Boston Water and Sewer Commission (BWSC) are included.

In 2013 the City invested in an Enterprise Energy Management System (EEMS) and an Energy Manager to track and report local government energy consumption, cost, and GHG emissions. Prior to 2013, reporting relied on annual data collection from numerous stakeholders in the auditing, budget, and purchasing offices. This manual process sometimes led to inconsistent data collection. Now the process is almost entirely automated, and with complete invoice data for over 7 calendar years, the City can track progress towards energy and GHG reduction goals on a monthly basis. By tracking this data more closely, the City is able to identify which departments, buildings or assets are contributing most to our overall portfolio, and, in the process, has identified billing errors leading to over \$1.2M in reimbursement credits for the City.

One notable correction in accounting methodology was a double-count identified in fleet fuels in FY15, corrected in the FY16 inventory. When the City began reporting vehicle fuels based on delivery point in FY15, it did not account for the fact that Boston Public Health Commission (BPHC), and Emergency Medical Services (EMS) fueled their vehicles at the Department of Public Works (DPW) and Boston Fire Department (BFD) fueling stations. Fueling reports from BPHC and EMS were counted separately even though their fuel use was already included in the DPW and BFD. This correction results in an approximately 141,000 gallon reduction between diesel and gasoline for the FY15 inventory. The correction is included in the new FY16 inventory, and all years FY05–FY14 are not affected by this correction.

Another notable correction was made to the FY17 electricity consumption. For every City of Boston electricity account, the City receives two bills: one from the local distribution company (Eversource) and one from the City’s energy supplier. The electricity consumption for each bill should be the same month-to-month but there are some scenarios where they do not match. The City has decided to source the electricity consumed by a particular account from the local distribution company bill as opposed to the energy supply bill. In FY17, the total electricity consumed by Boston Public Schools (BPS) was calculated based on energy supply bills. In this report, the City has



retroactively adjusted the BPS consumption figure to reflect the values listed on the local distribution company bills. The result is that the Chart titled “LGO Emissions by Source Type (Unadjusted)” will show a nominally higher GHG emissions contribution from electricity than the same chart did in last year’s Climate Action Report.

Finally, the City reviews historical electricity, steam, natural gas, and fuel oil consumption every year and retroactively updates consumption figures from previous fiscal years based on the latest bill corrections and recently discovered errors. These annual adjustments are typically insignificant.



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Mass Energy Consumers Alliance
Massachusetts Port Authority (Massport)
Massachusetts Water Resources Authority (MWRA)
Eversource
National Grid
Veolia

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APPENDIX II: HIGHLIGHTS FROM BOSTON'S PREVIOUS CLIMATE ACTION PLANS

Greenovate Boston (2014)

The 2014 update to our Climate Action Plan involved an extensive community process and identified nearly 100 actions to reach our 80x50 goal and to prepare for climate change, and to reduce waste. Programs and policies launched since the plan's release in January 2015 include:

- [Greenovate Boston](#), Mayor Walsh's initiative to engage all Bostonians in climate action, including through the Greenovate Leaders and Ambassadors programs.
- [Zero Waste Boston](#), the City's first ever roadmap to becoming a zero-waste community and cutting waste disposal by at least 80% by 2050.
- [Carbon Free Boston](#), Mayor's Walsh's initiative to make Boston carbon neutral by 2050, which was developed as a next step to the 80x50 vision laid out in the 2014 update.
- [Grassroots](#), the Department of Neighborhood Development's program supports the development of community gardens by transforming vacant lots.
- [E+ Green Building Program](#) to pilot net-zero and energy-positive buildings.

A Climate of Progress (2011)

The first update to our climate action plan, [A Climate of Progress](#) was developed from the recommendations of the Climate Action Leadership Committee and Community Advisory Committee, as well as five community workshops. Its key initiatives include:

- [Renew Boston](#), an energy efficiency outreach program that connected thousands of Boston residents to Mass Save and energy efficiency savings.
- [Building Energy Reporting and Disclosure Ordinance](#), an ordinance requiring that large buildings report their annual energy and water use and take an energy action or assessment every 5 years.
- Development of the [Massachusetts Stretch Energy Code](#), which was designed to be 15% more energy-efficient than the base building code.
- Oil heat efficiency programs offered by partner organizations.
- Programs to reduce vehicle miles traveled, including [Blue Bikes](#) and [Car Share Boston](#).

Climate: Change (2007)

The [2007 Climate Action Plan](#) was our first formal plan, and included several new policies and programs that still shape climate action in Boston today. The plan lay the groundwork for hallmark initiatives, including:

- [Article 37](#), a green zoning rule that requires that large new developments be LEED-certifiable.
- Reporting of municipal energy consumption and greenhouse gas emissions, included today in [CityScore](#).
- Mandate that all motor vehicle purchases be alternative fuel, flexible, or hybrid vehicles, unless not available. More than two-thirds of Central fleet vehicles are hybrid or electric.
- Audits and deployment of energy conservation measures and energy generation facilities, which has been formalized today in the [Renew Boston Trust](#) program.



- Prepare an integrated plan to address climate change risks, to be implemented in coordination with the City's plans for emergency response, homeland security, natural hazard mitigation, neighborhood planning and economic development - the [Climate Ready Boston](#) initiative.

