

SUSTAINABLE CONCORD

Revolutionary

Resilient

Ready



Climate Action & Resilience Plan

DRAFT

May 7, 2020

Prepared for the Town of Concord by Kim Lundgren Associates, Inc.

With a grant from the Massachusetts Executive Office of Energy and Environmental Affairs Municipal Vulnerability Preparedness (MVP) Program

Table of Contents

To be updated

Letter from Town Manager

Letter from Director of Sustainability

Acknowledgments

Introduction

Climate Action in Concord

GHG Emissions

Climate Impacts

Developing Our Plan

Engaging Our Community

Our Plan

Priority Actions at a Glance

Leadership

Plan Elements and Priority Actions

Built Environment

Energy

Natural Resources

Mobility

Preparedness

Next Steps

Implementation Blueprints

Appendices

Letter from Director of Sustainability

Climate change is one of the most pressing challenges of our time. It also presents an opportunity for collaboration and innovation across sectors, regions, and boundaries of all types. That is why I have personally committed my career to sustainability. I am constantly impressed by Concord's unwavering commitment to taking climate action and honored to be part of developing this climate action and resilience plan.

There is no doubt that we have entered a critical decade for bending the curve on greenhouse gas emissions to avoid the worst impacts of climate change. This climate action and resilience plan builds on Concord's legacy of environmental protection, sustainability, and resilience. It outlines the most important next steps to make progress toward our climate goals.

Tackling climate change will require mitigating our impact and improving our ability to adapt to a changing climate. That's why this plan outlines a vision and strategies for both.

It won't be easy, but we're in it together. In the early months of 2020, we have really learned what being in it together means. We began developing this plan in 2019 and I think most of us could not have imagined that we would be completing it at home through virtual meetings.

But we adapt. We held our first public meetings online. We celebrated the 50th anniversary of Earth Day with virtual gatherings. We used social media to connect and engage. We saw hopeful photos of dramatically reduced air pollution and a vision for what could be if we burn fewer fossil fuels.

The COVID-19 pandemic has emphasized the importance of social resilience, something that will be equally important in tackling climate change. It has changed the way we work, the way we connect, and the way we gather. But it has not changed our vision for a sustainable and resilient Concord.

I thank the Concord community for its enduring commitment to climate action and look forward to working with you all to implement our climate action and resilience plan.

Sincerely,

Kate Hanley

Director of Sustainability

Acknowledgments

Sustainable Concord was developed through a collaborative process between municipal staff and the community with support from our consultant team courtesy of a generous grant from the Massachusetts Executive Office of Energy and Environmental Affairs Municipal Vulnerability Preparedness (MVP) Program.

Municipal Advisors

Alan Cathcart	Director of Public Works		Power Supply & Rates
David Wood	Concord Light Director	Laura Scott	Administrator, CMLP
Delia Kaye	Natural Resources Director	Laurie Hunter	Superintendent of Schools
Erin Stevens	Public Information and Communications Manager	Marcia Rasmussen	Director of Planning and Land Management
Jan Aceti	Energy Conservation Coordinator, CMLP	Melissa Simoncini	Sr. Environmental & Regulatory Coordinator, Water/Sewer
Joseph O'Connor	Concord Police Chief	Ryan Orr	Facilities Director
Kate Hanley	Sustainability Director	Stephen Crane	Town Manager
Kate Hodges	Deputy Town Manager	Susan Rask	Public Health Director
		Tom Judge	Concord Fire Chief

Climate Action Advisory Board

Brian Foulds, Chair	Pam Hill
Jane Hotchkiss, Select Board Liaison	Warren Leon
Ruthy Bennett	Michael McAteer
John Bolduc	Peter Nichol
Brian Crouse	Jake Swenson
Courtney Eaton	

Consultant Team

Kim Lundgren Associates, Inc.
ONE Architecture
Center for Sustainable Energy

Introduction

The climate crisis requires revolutionary thinking and action. In Concord, we know a thing or two about that.

Concord has been committed to addressing climate change for decades. In 2019 and 2020, we came together as a community to solidify that commitment by developing **Sustainable Concord**, a Climate Action & Resilience Plan, that draws on the strength of our past and raises our ambitions for the future.

Our Vision for a Sustainable and Resilient Concord

- **Sustainable:** A sustainable Concord is a community that reduces our contribution to climate change by eliminating greenhouse gas emissions and preserves a high quality of life for future generations.
- **Resilient:** A resilient Concord is one that is prepared to minimize the impacts of climate change on our residents, economy, infrastructure, and natural environment.

Sustainable Concord is our roadmap to reduce greenhouse gas emissions 80% by 2050 and to address the impacts of climate change on our community.

Addressing climate change will require both mitigation and adaptation. Responsibility for climate change cuts across boards, committees, departments, agencies, and community groups. Many climate actions have benefits of reducing emissions and increasing adaptive capacity. The Concord community has made public commitments to reducing emissions and to climate resilience.

2017 Annual Town Meeting

Concord committed to **reducing GHG emissions** 25% by 2020 and 80% by 2050.

2018 Annual Town Meeting

Concord committed to prioritizing **climate resilience** goals and initiatives.

For these reasons, *Sustainable Concord* has been intentionally and strategically designed to prioritize **actionable solutions for both reducing greenhouse gas emissions and improving our community's resilience** to the impacts of climate change.

To develop **Sustainable Concord**, we called on a team of municipal staff, the Climate Action Advisory Board, and our entire community. As a result, we identified 5 ambitious — but attainable — goals.

The plan continues the work that has already been done to distinguish Concord as a leader on climate action and outlines 22 priority actions and 3 cross-cutting leadership priorities that can be taken over the next 5-10 years to ensure we are on a path to a sustainable future. Reaching the goals in this plan and our community's long-term goals will be an iterative and collaborative process. This plan is an important step in the journey and we commit to updating the plan along the way.

Climate Action in Concord

The Town of Concord has a history of forward-thinking action on climate and sustainability that serves as a valuable foundation for its continued leadership. Some highlights from the last decade include:

- 2011 Sustainability Principles adopted by Concord Select Board
- 2012 Citizen-led petition to ban single-use plastic water bottles approved
- 2013 Green Communities Designation
- 2014 Concord Solar Challenge
- 2015 Concord passes plastic bag ban
- 2016 Concord passes polystyrene ban
 - Receives its first electric school bus
 -
- 2017 Cooler Concord Fair draws 1000 residents to learn about ways to cut carbon at home
 - Concord's first Sustainability Director hired
- 2018 HeatSmart campaign results in increased adoption of climate-friendly heat pumps
- 2019 Bruce Freeman Rail Trail opens in Concord
 - "Your Sustainable Home Now!" resources launched
 - Sustainable Landscaping Fair
- 2020 Climate Action & Resilience Plan published

Concord's Climate Mitigation and Greenhouse Gas (GHG) Reduction Goals

1. 25% reduction in town-wide GHG emissions from 2008 baseline by 2020
2. 100% carbon-free electricity source by 2030
3. 80% reduction in town-wide GHG emissions from 2008 by 2050

OUR CLIMATE ACTION PROGRESS



54%

of Concord's electricity was carbon-free in 2018



30%

of Concord's open space is protected from development



Concord has banned water bottles, plastic bags and polystyrene



400+

Electric Vehicles in Concord



Deployed one of the nation's first electric

Progress on climate action in Concord has been thanks to the work by countless volunteers and community groups.

- Concord Sustainability and Energy Committee
- Natural Resources Commission
- ConcordCAN
- Mother's Out Front
- Concord On Tap
- REUSIT

Greenhouse Gas Emissions

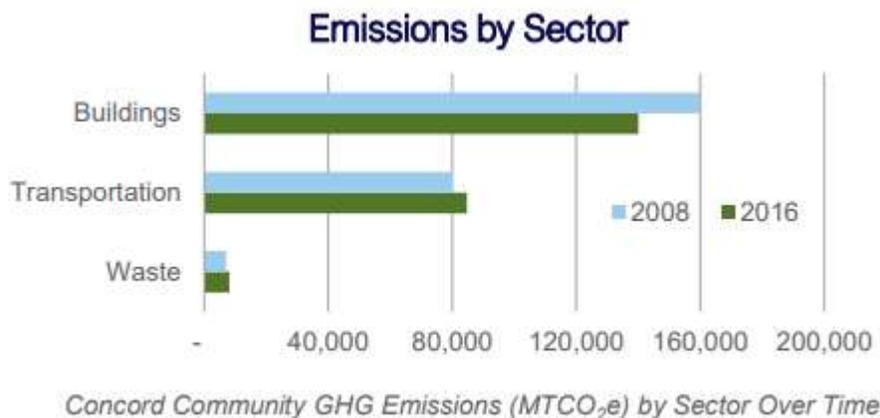
Climate change is one of the most serious challenges of our time. The good news is that we know where our greenhouse gas emissions are coming from and what we need to do. It won't be easy, but taking action together to reduce our emissions will reduce our contribution to climate change.

Concord conducted a baseline (2008) and an updated (2016) GHG inventory to understand how much we are emitting and from what sectors and fuels. Concord's GHG emissions totaled 246,890 MTCO₂e in 2008 and 232,951 MTCO₂e in 2016.

GHG emissions decreased 6% from 2008 to 2016.

This emissions reduction was largely driven by increased renewable energy, a decrease in electricity use by the commercial sector and more efficient energy use in homes.

Greenhouse gases (GHG) are essential to life on Earth as they provide a "blanket" in our atmosphere that traps heat and regulates the Earth's temperature. GHGs are released naturally in our environment for this very reason. However, we increase the level of greenhouse gases when we burn fossil fuels to power our homes, businesses, and automobiles and place material in our landfill to decompose. This increase in GHGs essentially creates a much thicker "blanket," which leads to higher global temperatures.



The 2016 emissions are equivalent to the emissions released by passenger vehicles driving approximately 578 million miles. That is more than travelling from the Earth to Mars and back- TWICE!

Between 2008 and 2016 emissions from buildings dropped by 12% while emissions from transportation grew 6%.

Sector	2008 (MTCO ₂ e)	2016 (MTCO ₂ e)	Percent change	Percent of Total 2008	Percent of Total 2016
Buildings*	159,779	140,072	-12%	65%	60%
Transportation	80,100	84,754	6%	32%	36%
Waste	7,011	8,126	16%	3%	3%
Total	246,890	232,951	-6%	100%	100%

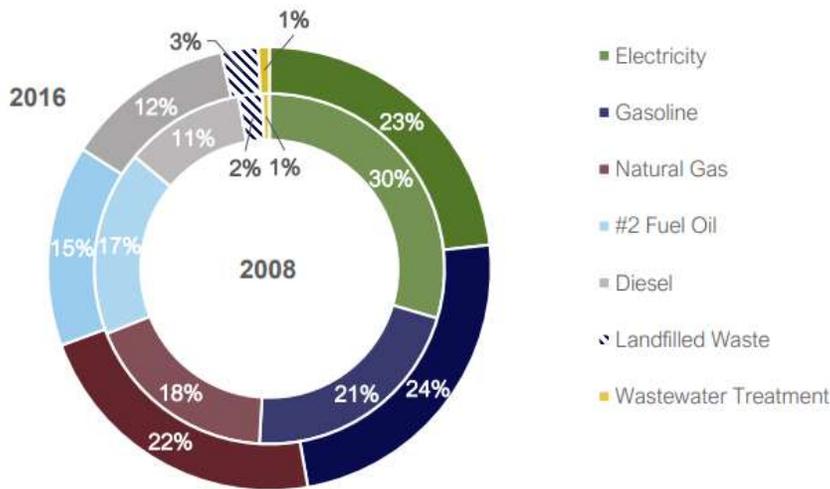


Figure 3. Concord's GHG Emissions by Source, 2008 (inside donut) and 2016 (outside donut)

We see similar trends in fuel usage – increased emissions from diesel and gasoline used for transportation and decreased emissions from electricity and fuel oil.

Concord's GHG emissions from 2008 to 2016 are trending in the right direction – down – but we will have to take action to achieve more significant reductions, and fast, in order to meet our goals.

That means an average reduction of 5,399 MTCO₂e each year until 2050. We know that reductions will be harder and harder to achieve so experts tell us that we should make more significant reductions in earlier years.

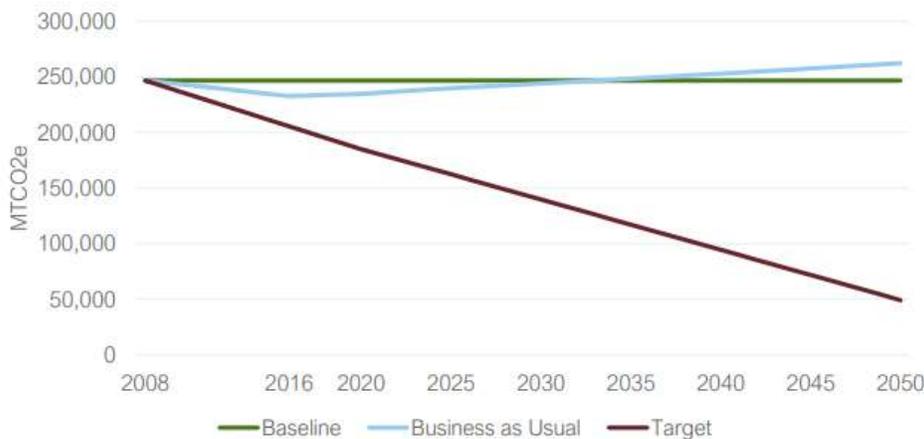
We may also have to overcome potential increases to emissions. If the Town of Concord's residential population grows according to projections, employment grows according to regional expectations, and no new technology or behavior changes are adopted, total emissions may reach 262,488 MTCO₂e in 2050. With policies and incentives, we can ensure that new development does not add to our emissions and avoids locking us into fossil fuel use and associated emissions for decades to come.

Business as Usual Emission Forecast

246,890 MTCO₂e in 2008
232,951 MTCO₂e in 2016

262,488 MTCO₂e
is the forecasted 2050 emissions under the business as usual scenario

49,378 MTCO₂e
is the Town's target for 2050 emissions

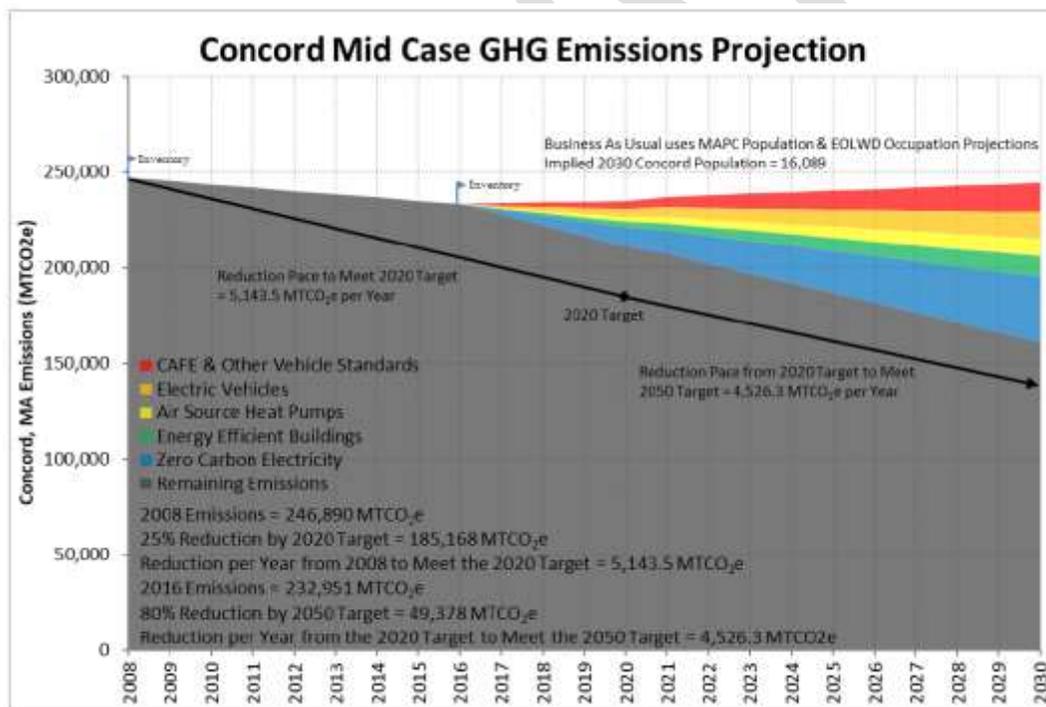


* BAU is forecasted from 2016.
** Target is based on 2008 baseline.

In 2019, the Town completed an analysis of the potential reduction in GHG emissions of five strategies – vehicle standards, electric vehicle adoption, air source heat pump adoption, energy efficient buildings, and zero-carbon electricity.

Strategy	Potential Reduction in Emissions (MTCO ₂ e)	Potential Reduction in % of total emissions
Installation of 2,000 air-source heat pumps by 2030	9,333	4%
Improved efficiency of buildings on track to meet state’s goal of 80% reduction in emissions by 2050	10,656	4.6%
Adoption of 3,000 new electric vehicles by 2030	13,797	5.9%
Improved vehicle fuel economy standards	15,279	6.6%
Zero Carbon Electricity	34,130	14.7%
Total	83,195	35.7%

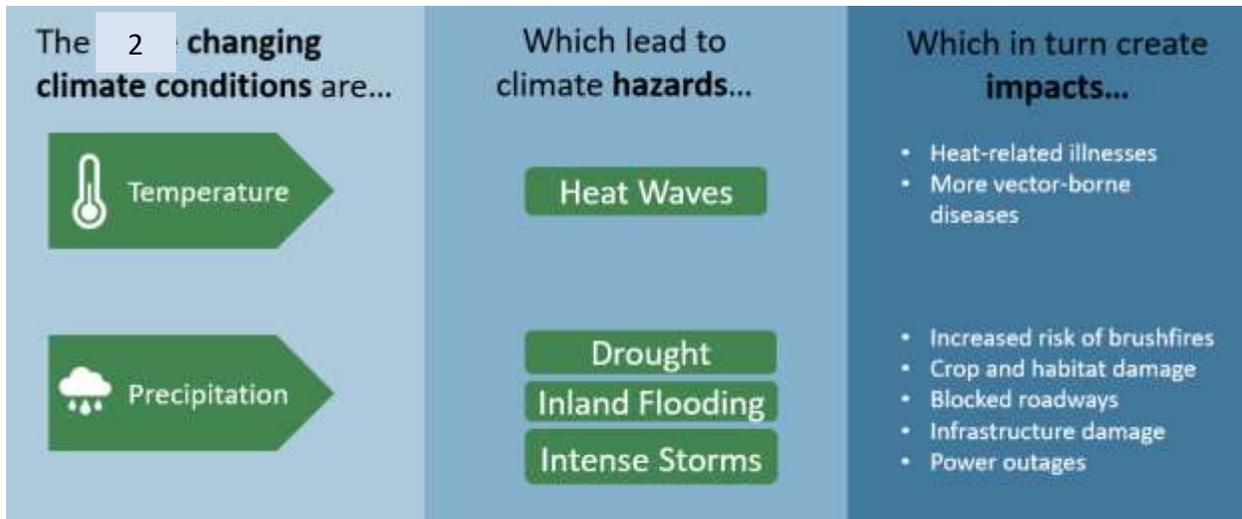
The analysis tells us that each climate strategy has significant potential to reduce emissions in Concord and some of them work together to amplify reductions. For example, increased electrification of vehicles and home heating and cooling has even greater emissions reductions when combined with zero carbon electricity.



However, even all 5 of these strategies combined do not necessarily reduce emissions in line with our community’s goal. In order to achieve the emission reduction necessary to meet our goals and curb climate change, we need to implement and accelerate these strategies and take even further action. This plan is an important step in turning this analysis into action.

Climate Impacts

We also need to be prepared for a changing climate. Even as we reduce our GHG emissions, we know that decades of increasing global emissions have made climate impacts inevitable. We are already experiencing impacts in Concord in the form of increased flooding, droughts, heat, and intense storms, and we can expect more.



Annual temperatures are rising, which changes how we will experience every season here in Concord and an increased frequency of **extreme heat**. Heat waves increase risk of heat-related deaths and illnesses and have significant impacts on our ecosystems, biodiversity, and crop production. We may also see changes in our energy demand required to maintain livable and comfortable temperatures in our homes, schools, and workplaces, increasing costs and emissions.

What we have already seen

+1.43° F

Change in temperature in the Northeast comparing the average annual temperature in 1986–2016 to 1901–1960

What we are expected to see

Middlesex County	Observed Baseline 1971-2000	Mid-Century Projected Change	End of Century Projection
Average Number Days Below 32° F	147	113	102
Average Number Days Above 90° F	7	32	46



48° F

Average annual temp 1971-2000



+4° F

Projected change in average annual temp 2020-2049

Middlesex County

Concord is experiencing an increase in **intense rainfall events** which can overwhelm our riverbanks and stormwater drainage systems causing flash flooding and damage to our property and infrastructure. Powerful precipitation runoff can also impact the health of our water systems. Runoff can result in greater nutrient loading in our rivers and ponds, which combined warmer waterbody temperatures can cause algal blooms and fish kills.

What we have already seen

↑ 70%
increase in the number of heaviest rainfall events from 1958-2010 in the Northeast

Algae Blooms in White Pond



Flooding in Basements



↑ 10%
increase in precipitation during the largest storms compared to 60 years ago in New England.

What we are expected to see

Average days per year in MA with precipitation greater than 1 inch

Observed Baseline 1971-2000	Mid-Century Projection
7 days	15 - 17 days

↑ 21%
projected increase in winter precipitation in MA in the 2050s compared to 1971-2000.

Even though more annual precipitation is projected overall, it is anticipated to fall in fewer extreme events in the winter and spring rather than in smaller more regular events throughout the year resulting in **increased potential for drought** during the periods with no rainfall. Drought can stress our water supply and impact ecosystems and crop production by altering the soil moisture and water depth that plants and animals rely on to flourish.

What we have already seen

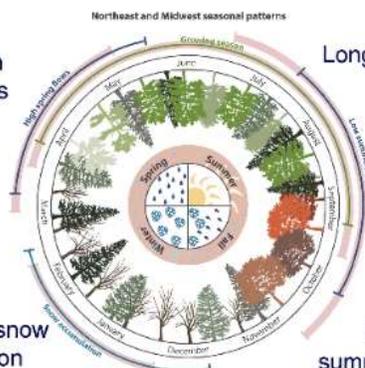
48 weeks
the longest duration of drought in MA since 2000 (Jun '16- May '17)



52.13%
of MA land was considered to be in "Exceptional Drought" (the highest level of drought) in Oct '16

What we are expected to see

Earlier high spring flows



Longer growing seasons

Shorter periods of snow accumulation

Longer periods of low flows in summer and fall

Shifted season projected from increasing temperatures and precipitation changes
Image credit: Northeast Climate Science Center, University of Maryland
Center for Environmental Science

Concord will experience more **intense storms** with stronger winds, persistent winter cold spells, and heavier, moisture-filled snow. Downed trees and snow-packed or icy roads disrupt emergency management systems, delay commutes, damage private property, and slow the movement of goods, which hinders our local economy.

Intense Storms

Nor'easters, ice storms, blizzards, hurricanes, and heavy rain events lead to downed trees, power outages, and property damage.

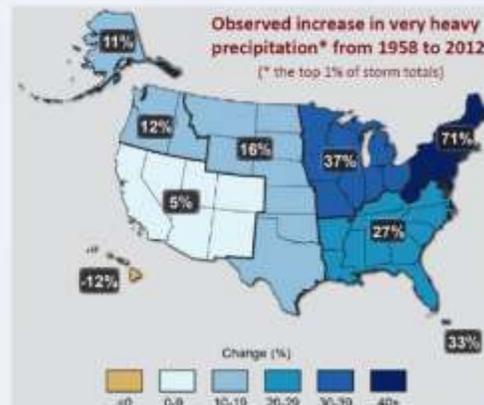
Trends

In the Northeast, the amount of precipitation falling in very heavy events between 1958 and 2010 increased by more than 70%.

Projections

Intense storms will become more frequent and more intense. Overall, annual precipitation is expected to increase between **6% and 9%**.

¹ National Oceanographic and Atmospheric Association. Storm Events Database. 2016.



*New England's most powerful storms now produce 71% more precipitation during their lifecycles than in 1958.*¹

Climate projections tell us that changing temperatures and precipitation patterns have the potential for dramatic impacts on our community's natural resources, infrastructure, economy, and social resilience. We need to prepare to adapt to our changing climate by integrating climate projections across town planning and implementing actions that bolster our resilience.

In 2018, Concord convened a group of stakeholders to participate in a community resilience planning workshop. Community members applied their expertise and experience to climate data and identified 3 priority actions for community resilience. This plan is an important step in taking action to improve our resilience to climate impacts.

Priority Actions from 2018 MVP Planning Workshop

- Promote and highlight low impact development and green infrastructure
- Develop an integrated resource management plan for the town
- Prioritize action plan for police/fire/DPW facilities located in the floodplain



Developing Our Plan

Sustainable Concord was developed through a collaborative Town-wide effort that included the Climate Action Advisory Board, municipal advisory team, residents, businesses, and the community.

The plan drew upon previous planning efforts and reports including the 2016 Community GHG Inventory, 2017 Hazard Mitigation Plan, 2018 Envision Concord (comprehensive long-range plan), 2017 Concord Municipal Light Plant Strategic Plan, and the 2019 MVP Planning Grant report, as well as regional studies such as the MAGIC Climate Change Resilience Report.

Advisors

Two groups served as primary advisors to the development of the plan, the Climate Action Advisory Board and a municipal advisory team.

Climate Action Advisory Board – Tasked with providing strategic direction on how Concord can achieve its mitigation and adaptation goals, Concord’s Climate Action Advisory Board includes members of the community with a depth and breadth of expertise in climate, energy, sustainability, and adaptation.

Municipal Team – The municipal advisory team was made up of department heads and municipal staff experts from departments and divisions including school department, water and sewer division, facilities management, public works, fire, police, natural resources, communications, planning, and town management.

A total of 9 advisory group meetings were held from September 2019 through May 2020. Advisors also provided extensive input on draft documents and plan materials.

Engaging Our Community

The Town of Concord committed to an inclusive and equitable engagement process.

- ✓ 128 responses to 2 online surveys
- ✓ 8 one-on-one stakeholder interviews
- ✓ 100+ attendees at community open house
- ✓ 3 presentations at community events
- ✓ 15 responses to business resilience survey
- ✓ 1 business open house
- ✓ 20+ social media posts
- ✓ 20+ ideas submitted via online form

What we asked

How do shocks or extreme events impact your community?

What's the vision you have for Concord?

What is your role in the future to make Concord more resilient?

What obstacles do you foresee for us during this process?

What resources or support can the Town provide?

What audiences are the most important to engage to successfully implement this project?

What we heard

"This will improve the town's energy profile and improve quality of life"

"Preserve and promote trees along routes for their cooling and protective (privacy and wind-blocking) benefits."

"We should be electrifying everything and switching to 100% renewables and helping CMLP achieve this goal. Best way to lower GHG emission with smallest impact on daily lives."

"Builders need to learn new techniques and understand the advantages of high efficiency buildings."

"Offer composting like we do for recycling. Make it easy to do."

Social Media Highlights

 **Town of Concord Sustainability**
February 14 · 🌐

Have you heard that Concord @cps_cchs was recently awarded a grant for a second electric school bus? Find out more about how Concord Public Schools and CCHS are working toward our community's sustainability goals! <http://ow.ly/eFdV50ykvJZ> #SustainableConcord



 **Town of Concord Sustainability**
March 20 · 🌐

Do you have an idea for improving our sustainability that's not listed in our MetroQuest survey? <https://sustainableconcord.metroquest.com/> Submit your ideas through our dedicated form: <http://ow.ly/cYxkE50yOYV6> #SustainableConcord

**Have an idea
for climate
action?**

Submit your idea here for how we can create a more resilient and sustainable Concord.

Event Highlight: Concord Open House

In December of 2019 we hosted a *Sustainable Concord* Open House at Concord-Carlisle High School. Over 100 attendees, from youth to seniors, and residents to businesses, actively participated in making Concord more resilient and sustainable by voting on top actions for the planning elements and proposing their own. At this event, attendees rotated between interactive stations while also learning about sustainability tips and resources, participating in kids' activities, and enjoying food and a raffle.



Youth Highlight

Empowering Concord youth to take climate action in their hands, a group of Concord High School students were trained as part of Concord's first ever *Sustainable Concord* street team. Street Team members were tasked with engaging community members of diverse backgrounds and asking people for their input on *Sustainable Concord*. Seven students were up to the challenge, and their work on the street team helped to strengthen our community's feedback into this planning process and initiated a dialogue about climate change among our youth.



Our Plan

Reducing our impact on climate change will require taking actions in sectors with the highest emissions like buildings and transportation. Adapting to the impacts of climate change will require a broad approach to improving the resilience of our social, natural, and built environment.

Our plan consists of 22 actions organized into 5 plan elements with goals for each.

Our plan also includes 3 cross-cutting priorities that demonstrate leadership in climate action.



Built Environment - Concord's buildings and solid waste system are resilient to a changing climate while minimizing their GHG emissions.

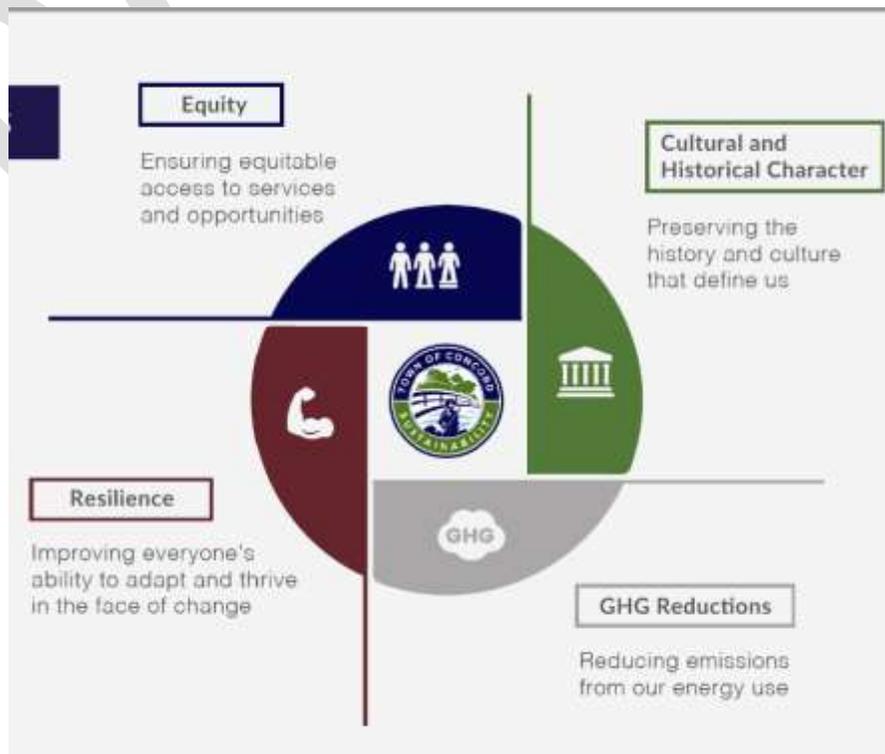
Energy - 100% of Concord's electricity is from carbon-free sources.

Mobility - Everyone has access to zero carbon transportation options to commute and get around Concord.

Natural Resources - Concord's natural resources are enhanced and supported to provide resilience benefits to the community and to maximize biodiversity and carbon sequestration.

Preparedness - Concord's critical infrastructure is designed and prepared for projected climate impacts and to reduce emissions.

In developing the plan, we cast a wide net to collect potential climate actions to consider for the plan. We reviewed town plans, identified local and global best practices in community climate action, and asked our plan advisors and the community for their ideas and expertise. With a long list of potential actions, we relied on our plan's 4 guiding principles to prioritize climate actions that best met our goals of GHG reduction and resilience and aligned with Concord's community values. These guiding principles can also serve as a framework for evaluating future climate actions.



Priority Actions at a Glance

The priority actions represent the most important steps for Concord to take now. These actions are intended to be initiated in the next 5 years, from 2020-2025.

Cross-cutting Leadership Priorities:

- **Integrate sustainability goals, metrics, and evaluation criteria into all Town planning, including staff and department evaluations and budgeting. - Governance**
- **Work with educators, parents, students, the School Department, and the State to bring climate education curricula into schools and student activities. - Education**
- **Prepare businesses and residents for the impacts of climate change through education and climate preparedness planning. – Social Resilience**

		GHG Reduction	Resilience	Town Character	Equity
 Built Environment	Increase electrification and reduce energy consumption of residential buildings.				
	Improve energy performance and reduce emissions from commercial buildings.				
	Set progressive sustainability standards for new municipal buildings and schools and develop a phased plan for deep energy retrofits to existing town buildings.				
	Establish policies and incentives for new development to achieve high sustainability and resilient design standards.				
	Create opportunities town wide to increase the waste diversion rate by 30%.				
 Energy	Redesign electricity rates to support energy conservation, peak load management, electrification, and renewable energy generation.				
	Provide incentives for businesses/homeowners to invest in renewable energy.				
	Shift CMLP’s electricity supply to 100% non-emitting resources by 2030.				
	Investigate options for utility-scale energy storage.				

		GHG Reduction	Resilience	Town Character	Equity
 Mobility	Increase use of public transportation and other low-carbon and no-carbon transportation options.	Very Positive	Positive	Neutral	Neutral
	Accelerate adoption of electric vehicles.	Very Positive	Positive	Neutral	Neutral
	Create a long-term plan to electrify school and municipal vehicle fleets.	Positive	Positive	Neutral	Neutral
	Improve availability, accessibility, and connections between bicycling and walking paths and sidewalks.	Positive	Very Positive	Positive	Neutral
 Natural Resources	Develop forest management plan to enhance health of Concord's forests.	Positive	Very Positive	Positive	Neutral
	Increase indoor and outdoor water conservation.	Positive	Positive	Neutral	Neutral
	Work with homeowners to promote sustainable landscaping practices.	Positive	Positive	Positive	Neutral
	Assess the vulnerability of natural resources most at risk to projected climate changes.	Positive	Very Positive	Positive	Neutral
	Assess and improve Concord's tree canopy.	Positive	Very Positive	Positive	Neutral
 Preparedness	Develop an integrated water resource management plan.	Neutral	Very Positive	Positive	Neutral
	Conduct a threat assessment for Concord's critical infrastructure.	Neutral	Very Positive	Neutral	Neutral
	Update stormwater regulations and create a stormwater utility.	Neutral	Very Positive	Positive	Neutral
	Increase the use of green infrastructure and low impact development.	Positive	Very Positive	Positive	Neutral

Contribution to Plan Principles

Very Positive	Positive	Neutral	Negative
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Leadership on Climate Action

As will be detailed in the plan sections that follow, Concord has identified 22 priority actions to be implemented over the next several years to significantly advance climate mitigation and resilience in 5 plan elements.

In addition to these actions, the Town also recognizes that truly effective climate leadership is not only about implementing a set of discrete actions. It is about integrating sustainability into daily operations, decision-making, and planning for the future. It requires applying a climate lens to how Concord governs and serves the needs of community members. It calls for a culture of climate change awareness and understanding.

For these reasons, the Town of Concord has identified 3 cross-cutting priorities for leadership:

- **Integrate sustainability goals, metrics, and evaluation criteria into all Town planning, including staff and department evaluations and budgeting. - Governance**
- **Work with educators, parents, students, the School Department, and the State to bring climate education curricula into schools and student activities. - Education**
- **Prepare businesses and residents for the impacts of climate change through education and climate preparedness planning. – Social Resilience**

Integrate sustainability goals, metrics, and evaluation criteria into all Town planning, including staff and department evaluations and budgeting. - Governance

Under leadership of the Town Manager's Office and the Sustainability Division, the Town will review and update existing administrative policies related to purchasing and procurement to include sustainability and climate resilience considerations. Similarly, they will undertake a review of the Town's capital planning process to establish a process and decision-making framework, building off this Plan's guiding principles and evaluation framework, that considers sustainability and resiliency standards and guidelines. This could result in development of a sustainability and resiliency checklist for capital projects. For these efforts to be successful, the Town will also need to put in place standard educational and awareness-raising elements into its staff onboarding and ongoing training for existing staff. Finally, the Town will need to measure its performance over time and utilize this information for continuous improvement.

Action to-date:

- ✓ New hires are briefed on sustainability goals and practices
- ✓ Preferences for sustainable purchasing
- ✓ Fuel efficient vehicle policy priorities fuel efficiency and requires sustainability approval
- ✓ Composting food waste at Town House

Work with educators, parents, students, the School Department, and the State to bring climate education curricula into schools and student activities. - Education

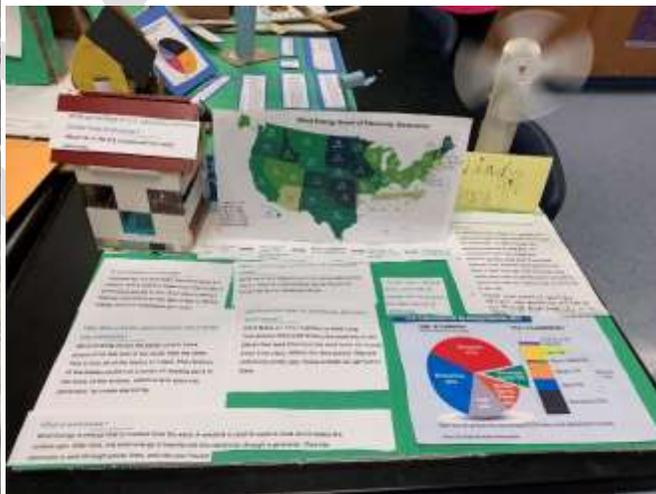
Concord understands that a resilient future depends on its future workforce and community leaders to understand climate change and the role that we each have to play in mitigating our contributions and preparing ourselves in a way that allows Concord to thrive for decades to come. That understanding must begin in our education system. The Town will work collaboratively with the education community to review current curricula in Concord's schools, at all grade levels, to identify opportunities for lessons on climate science and sustainability. The Town will continue to encourage youth, such as the Street Team formed for this planning process, to learn and engage with climate and sustainability topics in extracurricular activities as well such as volunteer opportunities, service learning, and internships/apprenticeships.

Action to-date:

Concord students learn about sustainability through their built environment, classroom and school operational practices, and in lessons in grades K-12.

- ✓ Outdoor classrooms and gardens
- ✓ Classroom recycling and waste reduction
- ✓ Composting in cafeterias
- ✓ Reusable trays and utensils in dining halls

Beginning in Fall 2020 all 9th grade students will take a newly designed earth science course focused on sustainability called Planet Earth.

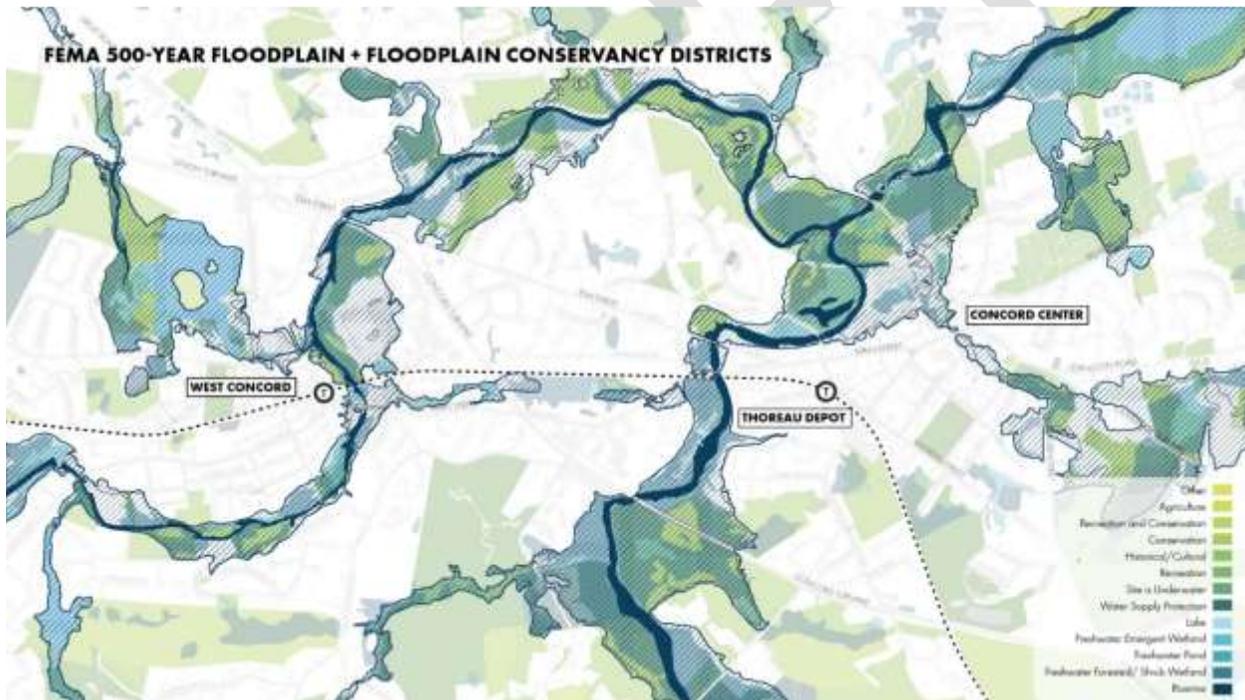


(L) Students designing a device to keep garbage out of the oceans and (R) 7th grade "Energy Shack" project where students research energy sources and build working models

Prepare businesses and residents for the impacts of climate change through education and climate preparedness planning. – *Social Resilience*

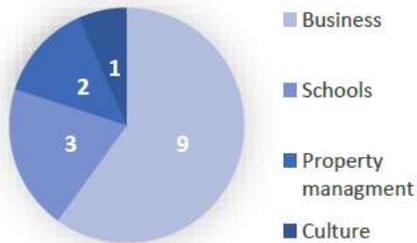
We as a society have learned much from the COVID-19 pandemic and subsequent impacts to our community, and the most important lesson has perhaps been the importance of preparedness. Whether it is a global pandemic, extreme heat emergencies, or a storm event – all risks we will be increasingly subject to—our community must prepare itself for the natural, infrastructural, social, and economic impacts we could experience in the years ahead. This begins with education and proceeds with taking actions to better prepare ourselves. Concord will need to work with businesses and residents to share information on climate risks and best practices for enhancing our resiliency. This can, and should, take many forms including:

- Investments to protect buildings and infrastructure from flooding and storm impacts
- Upgrading and backing up energy systems to reduce downtime
- Encouraging businesses to have emergency response and communications plans in place
- Preparing your home and family for emergencies – have preparedness kits, and essential supplies.



As part of this planning process, the Town collaborated with consultant team member, ONE Architecture, and reached out to local businesses via an online survey and an in-person workshop to discuss risks and concerns related to climate change. As a result, they developed a best practices guide for protecting businesses' buildings, including historic structures.

SURVEY PARTICIPANTS

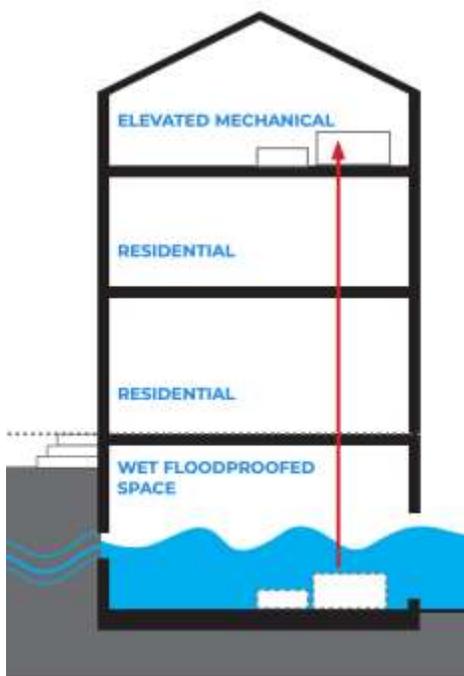


ECONOMIC IMPACT CONCERNS*



*Some survey participants listed multiple impacts

Resources like this, provided in Appendix X, are just one example of how Concord can begin to prepare our community for a future climate. An example of the design strategies described in the guide includes "wet floodproofing", as depicted in Figure X below.



Wet floodproofing (Source: BPDA)

These governance, education, and preparedness efforts when applied across Concord municipal operations, business, schools, and homes, all create a culture of climate consciousness and action throughout the community that will ensure Concord remains a climate leader in Massachusetts and beyond.

How to Read this Plan

This section will provide an overview of the plan element chapters, the eval criteria, what certain colors or icons mean, etc.

DRAFT



Built Environment

Our Goal for Concord's Built Environment

Concord's buildings and solid waste system are resilient to a changing climate while minimizing their GHG emissions.

Climate Impact

Buildings contribute 60% of community-wide GHG emissions. Operations of our built environment also generates waste that contributes to a smaller but not insignificant percentage of emissions. We can reduce emissions from our built environment by constructing new buildings and retrofitting existing buildings to be energy efficient and all-electric. Electricity is the only fuel that we can make 100% renewable so by electrifying heating and cooling systems in our buildings we can make our buildings net zero emissions.

More energy efficient buildings also are more resilient to climate change. They use less energy, cost less to operate and maintain, and are better equipped to maintain comfort for occupants during extreme weather events.

We can also implement policies and programs to reduce waste, reuse materials, divert more waste from landfills, and compost organic materials.

Action to-date:

- Concord adopted Massachusetts Stretch Energy Code
- Working toward a net zero energy design for new Concord Middle School
- CMLP provides rebates for efficient lighting, heat pumps, solar, and electric vehicles
- Participation in HeatSmart program accelerated adoption of and raised awareness of climate benefits of air source and ground source heat pumps
- Emissions from buildings decreased 12% between 2008 and 2016
- Designed Green Community since 2013 and reduced energy consumption in municipal buildings by 13%
- Municipal buildings converted to efficient LED lighting
- Concord Public Works collects local yard waste for composting
- Concord has banned water bottles, plastic bags and polystyrene

Priority Actions

	GHG Reduction	Resilience	Town Character	Equity
Increase electrification and reduce energy consumption of residential buildings.	Very Positive	Positive	Neutral	Neutral
Improve energy performance and reduce emissions from commercial buildings.	Very Positive	Positive	Neutral	Neutral
Set progressive sustainability standards for new municipal buildings and schools and develop a phased plan for deep energy retrofits to existing town buildings.	Positive	Positive	Neutral	Neutral
Establish policies and incentives for new development to achieve high sustainability and resilient design standards.	Very Positive	Positive	Neutral	Neutral
Create opportunities town wide to increase the waste diversion rate by 30%.	Positive	Positive	Neutral	Neutral

Contribution to Plan Principles

Very Positive

Positive

Neutral

Negative

Indicators of Success

Indicator	Baseline Data	Year	2030 Target
Energy use from building sector	2,033,538 MMBtu	2016	TBD
Greenhouse gas emissions from the building sector	140,072 MTCO ₂ e	2016	TBD
Energy use intensity (EUI) of residential/commercial sector	0.19 MMBtu/sq ft (commercial sector) 0.04 MMBtu/ sq ft (residential sector)	2016	TBD
Number of all-electric buildings	136 Residential 12 Commercial 122 Condo	2016	TBD
Waste diversion rate	40% (residential)	2016	TBD

Case Study: Preserving Our History, Preparing for Tomorrow

The improvements made to the Orchard house are an example of how even historic buildings can be the site of impressive energy and water efficiency projects. In the Orchard house, **geothermal pumps, LED lights, low-flow toilets, and paperless ticketing** have made the old house much more eco-friendly, all without having to remodel the underlying structure of the house.



Energy

Our Goal for Concord's Energy

100% of Concord's electricity is from carbon-free sources.

Climate Benefit

Electricity contributes 23% of community-wide greenhouse gas emissions from the fuels used to generate electricity. By Concord Municipal Light Plant (CMLP) purchasing renewable and carbon-free sources of electricity, we can reduce our emissions from the electricity sector to zero. Concord can also continue to install solar arrays in town to provide local renewable electricity. Combined with energy storage options, local renewable energy sources provide increased reliability in the case of extreme storms.

Energy Achievements:

- 54% of Concord's electricity was carbon-free in 2018
- Concord Municipal Light Plant (CMLP) ranked highly on climate scorecard from Massachusetts Climate Action Network
- CMLP offers rebates on energy efficient lighting and appliances, PV systems, home weatherization, and electric vehicles
- Concord has 5 large-scale commercial and utility-scale arrays in town, totaling 7.57 MW
- Over 300 homes have rooftop solar arrays

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Priority Actions

	GHG Reduction	Resilience	Town Character	Equity
Redesign electricity rates to support energy conservation, peak load management, electrification, and renewable energy generation.	Positive	Neutral	Neutral	Neutral
Provide incentives for businesses/homeowners to invest in renewable energy.	Positive	Neutral	Neutral	Neutral
Shift CMLP's electricity supply to 100% non-emitting resources by 2030.	Very Positive	Neutral	Neutral	Neutral
Investigate options for utility-scale energy storage.	Positive	Very Positive	Neutral	Neutral

Contribution to Plan Principles

Very Positive	Positive	Neutral	Negative
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Indicators of Success

Indicator	Baseline Data	Year	2030 Target
% carbon-free electricity	54%	2018	100%
Total MW capacity of renewable generation installations in Concord	3.4	2016	TBD
Avoided emissions due to renewable energy use	1,415 MTCO ₂ e	2016	TBD



Mobility

Our Goal for Concord's Mobility Choices

Everyone has access to zero carbon transportation options to commute and get around Concord.

Climate Benefit

Almost 40% of Concord's greenhouse gas emissions are the result of transportation, mostly from vehicles driven by Concord residents and businesses. We can reduce emissions from transportation by driving less, using shared and public transit options, biking, walking, and driving electric.

Improving active and shared transit options provides more equitable access to town centers and resources in Concord and regionally. Electric vehicles reduce operational costs and significantly reduce GHG emissions.

Low- and no-carbon transportation options also make us more resilient to changes in fuel and provides health benefits through reduced local air pollution.

Action to-date:

- 400+ electric vehicles registered in Concord
- 5 electric vehicles in municipal fleet and 1 electric school bus
- 9 public electric vehicle charging stations
- One of the nation's first electric school buses deployed and still in operation in Concord
- Concord Public Works and Concord Municipal Light Plant using a fleet fuel management system to monitor fuel consumption, vehicle efficiency, and vehicle maintenance
- Complete Streets policy to increase safety and accessibility of streets to multimodal transportation options

CASE STUDY: Electric Vehicle Ride-and-Drive

Priority Actions

	GHG Reduction	Resilience	Town Character	Equity
Increase use of public transportation and other low-carbon and no-carbon transportation options.	Very Positive	Positive	Neutral	Neutral
Accelerate adoption of electric vehicles.	Very Positive	Positive	Neutral	Neutral
Create a long-term plan to electrify school and municipal vehicle fleets.	Positive	Positive	Neutral	Neutral
Improve availability, accessibility, and connections between bicycling and walking paths and sidewalks.	Positive	Very Positive	Positive	Neutral

Contribution to Plan Principles Very Positive Positive Neutral Negative

Indicators of Success

Indicator	Baseline Data	Year	2030 Target
% reduction in greenhouse gas emissions from the transportation sector	84,754 MTCO ₂ e	2016	TBD
# of registered electric vehicles (FEV & PEV)	425	2020	TBD
Community vehicle miles traveled (VMT)	141,321,246	2016	TBD
# of public electric vehicle charging stations	9	2020	TBD
% of commuters who drive alone to work	70%	2016	TBD
% of commuters who walk	5%	2016	TBD
% of commuters who bike	0.6%	2016	TBD



Natural Resources

Our Goal for Concord's Natural Resources

Concord's natural resources are enhanced and supported to provide resilience benefits to the community and to maximize biodiversity and carbon sequestration.

Climate Benefit

Concord's natural resources are a critical part of its town character. Our natural resources provide resilience benefits including stormwater mitigation, reduced heat island effect, and improved water quality. Climate change will impact our wildlife, forests, tree canopy, wetlands, and water supply. Protecting and enhancing the adaptive capacity of our natural resources will help to maintain town character and make us more resilient to the climate impacts like extreme heat and changing precipitation patterns. Conserving water also means less energy required to treat, pump and deliver water to homes.

Tree canopy includes trees in our "urban" environment, including trees along the street and on public and private property.

Forests include trees in densely forested areas on conservation land or land managed by land trusts.

Action to-date:

- 30% of Concord's open space is protected from development
- Five wildlife underpasses exist along Route 2
- Concord Public Works provides water conservation audits and rebates for homeowners
- Town tree mapping displays inventory and health of street trees
- Natural Resources Division hosts monthly "Conservation Coffees"
- Concord's Sustainable Landscaping Handbook released in 2019
- Volunteers participate in annual invasive species removals (removed five 1-ton truck loads of invasive species in a single day in 2018)

Case Study: Harmony with Nature

Concord is home to miles of beautiful trails that carry visitors to our many sites of historical significance. Our community also relies on groundwater to provide daily drinking water to residents, and nearby wetlands are key to our ability to deal with heavy precipitation. All of this means that our town has an important connection and responsibility to the natural world. This is reflected in the fact that over **30% of Concord's Land is permanently protected land** our commitment to fighting invasive species and protecting wildlife habitat.

Priority Actions

	GHG Reduction	Resilience	Town Character	Equity
Develop forest management plan to enhance health of Concord's forests.	Positive	Very Positive	Positive	Neutral
Increase indoor and outdoor water conservation.	Positive	Positive	Neutral	Neutral
Work with homeowners to promote sustainable landscaping practices.	Positive	Positive	Positive	Neutral
Assess the vulnerability of natural resources most at risk to projected climate changes.	Positive	Very Positive	Positive	Neutral
Assess and improve Concord's tree canopy.	Positive	Very Positive	Positive	Neutral

Contribution to Plan Principles

Very Positive

Positive

Neutral

Negative

Indicators of Success

Indicator	Baseline Data	Year	2030 Target
Residential water consumption in gpd	68	2016	TBD
% tree canopy coverage	58%	2016	60%
Forest health			TBD



Preparedness

Our Goal for Preparedness

Concord's critical infrastructure is designed and prepared for projected climate impacts and to reduce emissions.

Why is it important to climate?

Concord's infrastructure including critical facilities, water, sewer, and stormwater systems provide valuable services to the community. Climate hazards pose threats to those critical systems. Being prepared for those impacts will make our community more resilient to the impacts of climate change.

Action to-date

- Directly engaged nearly 500 people in the Municipal Vulnerability Preparedness Program
- Identified critical infrastructure in floodplains
- Water and Sewer Division manages and monitors water quality
- Integrate green infrastructure into municipal projects through elements such as rain gardens

Priority Actions

	GHG Reduction	Resilience	Town Character	Equity
Develop an integrated water resource management plan.				
Conduct a threat assessment for Concord's critical infrastructure.				
Update stormwater regulations and create a stormwater utility.				
Increase the use of green infrastructure and low impact development.				

Contribution to Plan Principles

Very Positive	Positive	Neutral	Negative
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Indicators of Success

Indicators provide the status of the goal area. Each indicator that is used to track progress on this planning process will include baseline metrics as well as targets for 2030.

Indicator	Baseline Data	Year	2030 Target
% pervious surface retained or increased	90.7%	2016	92%
Water quality			Water leaving Concord is cleaner than water entering
# of green infrastructure and low impact development projects implemented			

Next Steps

The Sustainability Division, within the Town Manager's Office, will be responsible for overseeing implementation of the plan, and ensuring it stays up-to-date. Progress toward goals will be tracked and reported to the community in annual reports.

Tackling climate change is a team effort and will take engagement by all sectors of our community. Climate change is also a global issue and cannot be solved by Concord alone. The Town commits to continuing to engage in regional groups to advance climate action at a broader scale.

Implementation Blueprints

See separate draft document.

Appendices

- GHG Inventory Report
- GHG Reduction (Wedge) Analysis
- Survey Summaries
- Business Resilience Survey and Workshop Summary
- Business Resilience Best Practices Guide

References