



Climate Change

Climate change is the existential threat facing our region and our world. Because of human-generated greenhouse gas (GHG) emissions, our planet is warming significantly. This is changing our weather systems, bringing more frequent and intense storms, extreme temperatures, sea level rise, and flooding. It's affecting human health and disrupting animal and plant life. These changes are already altering our built and natural environment – food production, land use, transportation, the economy, and health to name just a few – and the effects will only continue to worsen and grow over time. The more we do now to mitigate climate change and adapt to its effects now, the better off we will all be in 2050.

While we are likely unable to reverse these effects completely, we certainly have agency to reduce the severity of the impacts and prepare and adapt to those occurring or to come. Climate change mitigation through the utilization of energy efficiency, renewable energy, smart growth, clean mobility, natural assets for carbon storage, electrification, and many other measures can reduce current – and avoid future – GHG emissions. These emissions are the direct drivers of climate change, and we know that the best and most up-to-date science, as memorialized by the Intergovernmental Panel on Climate Change, asserts that we must substantially reduce GHG emissions to restrict the increase in global temperature to less than 1.5 degrees Celsius and avoid the most catastrophic impacts of climate change (<https://www.ipcc.ch/sr15>). Clean energy and other climate-smart technologies, systems, and policies – many of which can be deployed or incentivized by cities and towns – are a tremendous opportunity to decrease carbon pollution while also supporting innovation, workforce and economic development, and new models that re-envision and rebuild our communities more equitably.

One of the most compelling justifications for climate action locally is the financial case, both in terms of cost savings from more efficient systems and the opportunity to avoid increased costs from inaction or impending risk. As a coastal region, we are under threat by sea level rise. Three feet of rise could cost the region \$104 million in property taxes over 89 Metropolitan Boston municipalities (Shi and Varuzzo, 2020). Communities further inland are already experiencing increased flooding and extreme heat impacts. And the current and future impacts of climate change will continue to burden some populations and locations more than others. Low-income and BIPOC communities, while contributing the least to the causes of climate change, stand to bear the worst impacts due to systemic inequities that contribute to heightened sensitivity to climate change impacts, and constrained capacity to adapt. Older adults and those with certain health conditions are particularly vulnerable. Today, 13% or over 400,000 residents live in census tracts that have the highest vulnerability. Seven cities in our region are especially at risk: Boston, Chelsea, Everett, Framingham, Lynn, Malden, and Revere. Many of these same

communities, not coincidentally, have also experienced some of the worst impacts from the COVID-19 pandemic.

There is much that we can do here locally to reduce and prepare for impacts and lessen the burden on low-income and BIPOC communities. In the last 10 years, the Commonwealth of Massachusetts and many of its municipalities have made significant strides to reduce GHG emissions and to initiate the actions necessary to build a more resilient region. And with the Biden Administration prioritizing federal climate action, the prospect for federal resources and pro-climate administrative actions is more promising. One challenge we will continue to face is coordinating across many sectors and levels of government to effectively and immediately take the actions that are needed. Behavior changes from all of us will play a large role in our success as well – from decisions about where we live and shop to how we travel.

Vision

- ▶ **In 2050**, the Metro Boston region is prepared for the extremes of a changing climate. We are prepared for more high-heat and extreme-cold days, increased rainfall, extended periods of drought, stronger storms, and a rising sea. Homes, schools, workplaces, facilities storing or producing hazardous materials, and infrastructure are located away from serious threats or are designed to withstand them. When major climate events interrupt critical services, the response is managed to minimize disruption. People have the resources, networks, and supports to withstand climate emergencies and to recover when disaster strikes. Older adults, children, residents with lower incomes, Environmental Justice communities, and other vulnerable populations can safely live their lives and fully enjoy outdoor activities. Neighborhoods are designed and improved to protect the health of residents, with ample shade, drainage, and green space. Wetlands, water bodies, forests, and plant and animal communities are restored, protected, and are able to adapt to climate change impacts.
- ▶ **In 2050**, Metro Boston is deeply energy efficient and climate-smart. We power our communities, buildings, and vehicles with renewable energy. The region benefits from having made deep cuts in greenhouse gas emissions before 2030 and reaching net zero emissions by 2050, as part of the state and global effort to avoid the worst impacts of the climate crisis. Making zero-emissions choices for food, clothing, and other goods is easy, affordable, and convenient for everyone. The public health, resiliency, and other benefits of a net-zero carbon future are distributed equitably, lifting up all communities, particularly those who had historically borne greater burdens.
- ▶ **In 2050**, our air is pure, indoors and out. Our cities and towns are healthy, with beautiful parks and natural areas accessible to all. And our cities are quieter, with less polluting and more efficient transportation technologies. Contaminated sites are cleaned up and turned to new uses. There is less waste. Unavoidable waste produces energy, fertilizes soil, or is reprocessed. We have enough fresh water from our wells, streams, and reservoirs to meet the needs of people and wildlife. Our farms and fisheries produce plentiful and healthy yields and are sustainable. Habitats, forest, wetlands, and other natural resources are protected and enhanced.

How we got here

While resulting in great economic growth and urbanization, the Industrial Revolution was powered by fossil fuels. Fossil fuels continue to account for the majority of our energy generation and transportation fuels, generating unsustainable levels of GHGs and other air pollutants. Our entire modern infrastructure is heavily reliant on fossil fuels – from how we heat our millions of homes to what our cars run on. Converting 70 years of infrastructure to renewable and non-polluting sources will take incredible investments and behavior changes.

As Greater Boston urbanized and suburbanized, the way we grew has also contributed to increased emissions and reduced our capacity to minimize the negative impacts of climate change. Low-density, auto-dependent suburban growth requires more energy per household and is often farther removed from public or active transportation to access jobs, schools, recreation, and shopping destinations. Converting undeveloped lands and filling wetlands to accommodate development has resulted in impervious surfaces and reduced capacity to absorb and infiltrate stormwater, contributing to increased heat and flood vulnerabilities and water pollution. The land alone devoted to personal automobiles is staggering.

We have also built a region that is not particularly resilient. Many aspects of our built and social environments lack the ability to adjust under stress. The levees in New Orleans were not designed to handle the amount of floodwaters experienced during Katrina, leading to catastrophic failure. Had the coastal wetland system been left intact, it is likely that New Orleans would have been spared the worst of the hurricane. Here in Greater Boston, we also have lost or damaged our coastal wetland. Our electric grid and delivery systems are another example of a system that does not build sufficient resiliency into its design. If one part of the system is knocked out of commission, downstream customers also lose power.

Social resiliency also varies dramatically by wealth, race, and geography. During the pandemic, some people with means temporarily relocated out of the city. Others had the option to drive into work or to work from home, but these options were not available to all. Often, lower-income and BIPOC service workers did not have such options and were amongst those most hard-hit by COVID-19. Similarly, in a climate context, individuals and communities with less adaptive capacity (access to info and social networks) and greater sensitivities (age, health, etc..) are at higher risk to bear the worst impacts of climate change and have the least ability to easily recover from disruptions or threats.

Challenges

We face many, yet not insurmountable, challenges to realizing a Net Zero, climate resilient region. Among the hardest are the time scales involved. Current international consensus is that we have until 2030 to reduce global greenhouse gas emissions by at least 45% below 2010 levels globally and achieve net zero by 2050 to mitigate the worst impacts of climate change. Here in Massachusetts, the new climate law, An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy, signed by the Governor in early 2021, commits the Commonwealth to attain 50% reductions below 1990 levels by 2030 and 75% by 2040 on our way to net zero by 2050. All of these targets require immediate action now to undertake the necessary changes to achieve our desired outcomes in these timeframes. The decisions made by various levels of government, federal, state, regional, and local; individuals; and private

sector organizations must be aligned, regardless of the cycles that corporations and political elections run on. Quarterly profit targets and two- to four-year political terms are barriers to making decisions and investments that benefit future generations.

Price signals are another barrier to consumers making choices that will help minimize the negative impacts from climate change. Due to long-standing subsidies supporting fossil fuels, industrial agriculture, and global trade policies, cheap and more environmentally damaging clothes, food, cars, heating and cooling systems, and other goods are often the less expensive option for consumers. And for households with limited discretionary budgets, the less expensive option is often the only option. We've recently seen renewable energy generation costs become competitive with fossil fuels and rebates for electric vehicles are narrowing the price premium over gas-powered cars, but for so many products and goods, the least expensive options are those with the highest environmental impact and the conventional product, even with cost parity, is often the preferred choice. These transitions are slow, unpredictable, and often need support to accelerate or shift more rationally.

Another key challenge is the amount of collaboration and coordination demanded to rise to the challenge. Climate mitigation and adaptation touches many sectors, from emergency management to wetlands restoration and public schools. While the new climate law is a landmark step towards meeting our Net Zero goals, now comes the hard work of implementation, while also needing to move forward on adaptation planning and investments and system modernization across energy, water and land management, telecommunications, commerce, transportation, and much more.

Recommendations

We'll need to dramatically increase renewable energy production and energy efficiency, while ensuring access and affordability for EJ populations. Microgrids, energy storage, and demand response will need deeper implementation, and the electric and gas utility markets will need to support greater decentralized generation, better and more expanded transmission, and much higher levels of renewable energy. Existing buildings will need resources for deep energy retrofits and higher performance standards for new construction and renovations. And public and personal transportation will need to turn sharply towards an electric future that does not add to our congestion or sprawl woes.

To move towards a more resilient region, the three priorities are to invest in green infrastructure, microgrids, and energy storage especially in Environmental Justice locations; prepare our buildings and infrastructure to better withstand the negative impacts from climate change; and to move out of harm's way, through a willing seller's program, better regulatory signals on where not to build, and improving our flood programs and data.

To better manage our finite freshwater resources, we need to move to an integrated water resource management approach, increase local recharge, and ensure affordable access to water through investments and limiting non-essential outdoor water use.