Keeping Metro Boston Cool: A Regional Heat Preparedness and Adaptation Plan

Metro Mayors Climate Taskforce
Metropolitan Area Planning Council

June 2022

Acknowledgements

MMC Climate Taskforce

Climate Preparedness Committee Members

Community Engagement Liaisons

MAPC Authors

Metro Mayors Coaltion
CLIMATE
TASKFORCE

MAPC
METROPOLITAN AREA PLANNING COUNCIL
Smart Growth & Regional Collaboration

MVP
Municipal Vulnerability
Preparedness

About the Metropolitan Mayors Coalition (MMC) Climate Taskforce
The Metropolitan Mayors Council (MMC) is a collaborative group of 15 municipalities in the urban core of Metro Boston that work together on shared issues affecting the region. Municipalities include Arlington, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Newton, Malden, Medford, Melrose, Quincy, Revere, Somerville, and Winthrop. In 2015, MMC made a commitment to better prepare the region for the impacts of climate change and started the Climate Preparedness Taskforce. In 2020, the City of Cambridge received a Municipal Vulnerability Preparedness (MVP) Action Grant from the Executive Office of Energy and Environmental Affairs (EEA) on behalf of the MMC Climate Taskforce to better prepare the region for extreme heat. Thank you to the Barr Foundation for your continued support of the Metro Mayors Climate Taskforce and this project. More information about the Climate Taskforce can be found: Metro Mayors Climate Preparedness Taskforce – MAPC[1]

[1] Metro Mayors Climate Preparedness Taskforce – MAPC The fifteen communities include Arlington, Boston, Braintree, Brookline, Cambridge, Chelsea, Everett, Malden, Melrose, Medford, Newton, Quincy, Revere, Somerville, and Winthrop.

Contents

Section 1. Introduction 4

Section 2. Understanding Climate-Driven Heat in Metro Boston 9

Section 3. A Roadmap for Action: Priority Strategies and Actions for Municipalities and the Region 14

- **Cool Communications** 15
- **Cool Communities** 19
- **Cooling Our Homes and Buildings** 25
- **Cooling Our Blocks** 30
- **Cooling Our Region** 35
- **Emergency Response** 38

Section 4. Monitoring, Assessment and Evaluation 41

Section 5. Implementation and Next Steps 43

Appendix 45

Section 1. Introduction

The Metro Boston region is getting hotter and experiencing more extreme heat days over 90 degrees. In summer 2021, Metro Boston experienced four distinct heatwaves of extended periods above 90 degrees, including two heatwaves in June. Extreme heat is a growing threat to public health and safety and is considered the deadliest extreme weather event in the US.[2] Not only are our summers getting hotter, but spring and fall are also getting warmer, causing changes to growing seasons, an increase in seasonal allergies, and a rise in insect-borne diseases. Climate change science predicts that in the next 10 years, by 2030 the Metro Boston region could experience up to 37 days over 90 degrees and by 2050 that number could skyrocket to over 60 days depending on global greenhouse gas emissions.[3] This climate-driven heat[4] poses a threat not only to health and safety, but also to our region's infrastructure, homes, natural environment, and economy. It is critical to prepare, protect, and adapt our region for rising temperatures. While local action is necessary, a regional approach can provide additional capacity, resources, expertise, efficiencies, and a shared framework for addressing extreme heat.

Extreme heat causes more deaths in the United States than all other natural disasters. In the Pacific Northwest Heat Dome of 2021, estimated deaths across Oregon and Washington are over 600.[5] A recent study of global heat deaths across 732 locations showed that 37% of these deaths could be attributed to climate change.[6] Heat is often referred to as a "silent killer", as many heat-related deaths occur with those living alone in their own homes. Tracking of heat-related deaths is also complicated, as they may not

This plan uses the term "Climate-Driven Heat" to describe the increase in temperatures due to climate change, including both the increase in extreme temperatures as well as average temperatures.

[2] Michelle Samuels (2020). Heat May Kill More People in the US than Previously Reported. Boston University School of Public Health. https://www.bu.edu/sph/news/articles/2020/heat-may-kill-more-people-in-the-us-than-previously-reported/

[3] "Resilient Cambridge: Heat Risk" (June 2021) HEAT RISK (arcgis.com)

[4] In this plan we use "climate-driven heat" to describe the increase in temperatures due to climate change, including both the increase in extreme temperatures as well as the warming of other seasons.

[5] https://www.nytimes.com/interactive/2021/08/11/climate/deaths-pacific-northwest-heat-wave.html

[6] https://www.cbsnews.com/news/climate-change-37-percent-heat-deaths-study/

be marked as such in the coroner's report or death certificate.[7]

This plan uses the Social Determinants of Health Framework to better understand how the conditions in which people live, work, go to school, and play impact their exposure and risk to extreme heat and rising temperatures. While extreme heat and rising temperatures impact everyone, some are more at risk than others. Social determinants of health are the conditions in which people live that affect a wide range of health risks and outcomes. They include factors such as our social status and connections, education, financial resources, access to services, and neighborhood and built environment. These factors influence how we experience climate changes, including rising and extreme temperatures. Social determinants can buffer climate impacts by providing us with a means to cope or adapt to our changing environment. They can conversely amplify climate impacts, especially among communities that have been subjected to structural racism and other inequities.

Regional Approach to Preparing and Adapting to Extreme Heat

Planning, coordinating, and implementing climate-driven heat resilience at a regional level will be necessary to prevent and avoid worsening outcomes. The Metro Mayors Coalition includes the communities of Arlington, Braintree, Brookline, Boston, Cambridge, Chelsea, Everett, Malden, Medford, Melrose, Newton, Quincy, Revere, Somerville, and Winthrop. The 15 communities in the Metro Mayors region are some of the densest communities in the Commonwealth, home to more than 1.4 million residents. The impacts of climate-driven heat do not stop at municipal boundaries, and neither do the people that live, work, or go to school in our region. A person may live in Medford, but commute through several cities to get to work in downtown Boston. A resident may live in Cambridge, but the closest cooling center may be a few blocks away from them in Somerville. Additionally, extreme heat also impacts regional infrastructure such as disruptions and reliability of the electricity grid, overheating of public transit and rail systems, the buckling of bridges and concrete, and impacts to the regional water supply.

Overarching Goals for the Plan

This Heat Preparedness and Adaptation Plan provides an actionable roadmap and recommendations on how the region can better prepare for and adapt to extreme heat and rising temperatures. This plan primarily addresses strategies and actions that reduce risk and increase preparedness through public health, planning, land use, and other municipal and regional actions. This comprehensive plan also provides strategies and actions to improve municipal and regional response to heat emergencies, although it is not intended to stand in for a robust municipal heat emergency response plan.

1. **Manage and Reduce Risks Associated with Climate Driven Heat**
    a. Reduce exposure and the impacts of extreme heat and warming temperatures on public health, infrastructure, economy, and environment in the urban core of Metro Boston.

[7] https://www.epa.gov/climate-indicators/climate-change-indicators-heat-related-deaths

    b. Reduce the impacts of urban heat island and the disparities between urban and suburban environments.
2. **Improve Preparedness for Extreme Heat Events and Emergencies**
    a. Increase access to safe and affordable cooling at home, in the workplace, and at school
    b. Increase access to safe cooling in public spaces
    c. Improve local and regional response to heat emergencies
3. **Advance Climate Equity and Reduce Disparities within the Region**
    a. Build capacity for implementation by increasing social capital and connectedness in communities most vulnerable to extreme heat
    b. Prioritize interventions that address public health impacts
    c. Build and strengthen partnerships between community-based organizations and local government
4. **Inform and Build Capacity to Prepare and Respond to Climate Driven Heat at Municipal, Regional and State Level**
    a. Develop common language/vocabulary, data and information sharing, metrics, and evaluation for local and regional heat resilience planning
    b. Increase capacity, expertise, and collaboration for heat resilience in municipal public health and planning departments
    c. Inform local, State, and Federal stakeholders and decision-makers

Creation of the Plan

The Metropolitan Area Planning Council (MAPC) developed this plan on behalf of the Metro Mayors Coalition Climate Taskforce and the City of Cambridge. This plan was made possible by a Massachusetts Executive Office of Energy and Environmental Affairs (EEA) Municipal Vulnerability Preparedness Action Grant, and additional climate resilience funding from the Barr Foundation.

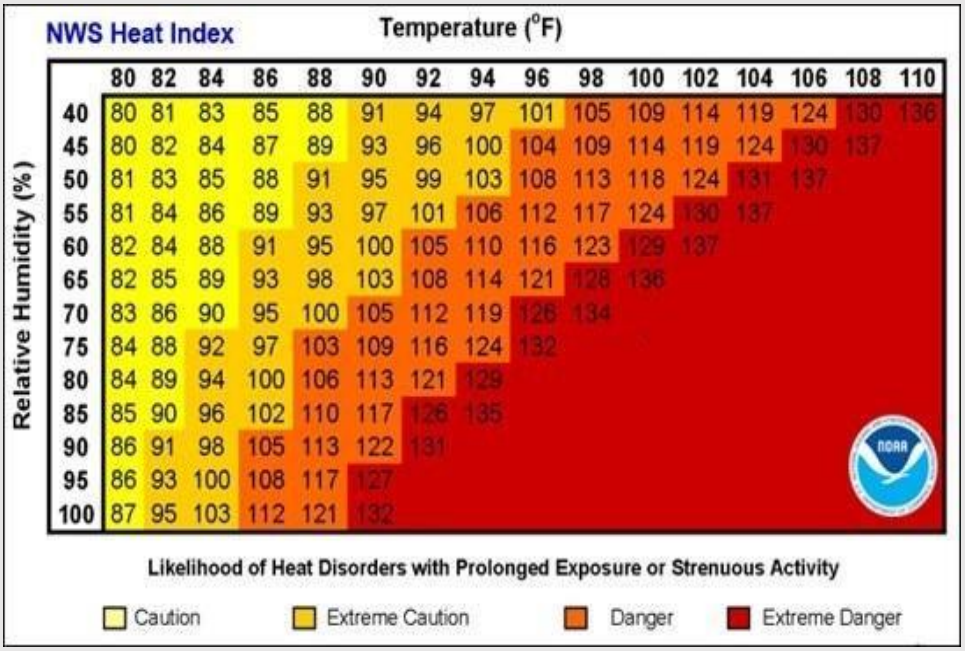
A Heat Preparedness Committee, comprised of municipal planning and public health staff, as well as representatives from community-based organizations from throughout the MMC region helped guide the planning process. Ten Community Engagement Liaisons were selected from across the MMC region to both increase engagement with communities on issues of extreme heat and climate change, as well as participate in the planning process. MAPC also conducted a regional survey of residents on how people experience extreme heat. Two virtual public forums were held, as well as a municipal workshop and emergency response roundtable.

Intended Use and Audience of the Plan

This plan is intended to inform and guide both municipal and regional work of the Metro Mayors Coalition Climate Taskforce. Across the fifteen municipalities, there is a diversity of municipal staff responsible for different elements of preparing for and adaptation to extreme heat including those in planning, sustainability, public health, and emergency preparedness. Other departments may also be responsible for aspects of the work including schools, public

works, councils on aging, and family services. In addition to creating a shared roadmap for municipal governments and regional coordination, recommendations in this plan may also be useful for community-based organizations and other local partners doing extreme heat preparedness and resilience work. Similarly, there are several aspects of the plan that must be done at the state level, either by various state agencies or through state legislation.

- **Municipal departments** across a wide range of sectors may touch about heat resilience elements. Much of the existing work is led by Public Health, Emergency Management, and planners working on climate and sustainability. Other Departments should be engaged in heat preparedness and adaptation planning and implementation including, Planning and Community Development, Public Works, Communications, School Departments, Senior/Council on Aging, Parks and Recreation, Economic Development, Transportation and Mobility, Housing, and Inspectional Services.
- **Community-based organizations, non-profits, and houses of worship** working directly with neighborhoods and communities to provide services (including Community Action Programs, Homeless service providers, affordable housing), education and outreach, and advocacy.
- **State and Quasi-State Agencies** that own or operate property and infrastructure in the Metro Mayors Region including Department of Conservation and Recreation, Massachusetts Bay Transportation Authority, Mass Department of Transportation, Massachusetts Water Resources Authority, and others.



Common Terms and Definitions

Ambient Air Temperature: A measure of how hot or cold the air is measured by a thermometer.
Climate-Driven Heat: Describes how global climate change is impacting local weather patterns, including an increase in extreme heat days during summer, increases in average temperatures, and warmer temperatures in spring and fall.
Extreme Heat: In Massachusetts there is no formal definition, but often considered days where air temperature is above 90°F, but heat index may be higher due to humidity levels. Note that increases in adverse health outcomes may occur before reaching 90°F, particularly with high humidity levels.
Excessive Heat Warning: Issued by the National Weather Service when the daytime heat index (combination of air temperature and humidity) is greater than or equal to 105°F for two or more hours.
Excessive Heat Watch: Issued by the National Weather Service when the forecast shows excessive heat warning in the next 24-72 hours is likely.
Heat Index: A measure of how hot it feels when relative humidity is factored in with the air temperature (the "feels like" temperature). Heat is more harmful to human health when humidity is high because humid air hinders the evaporation of sweat, and thus reduces the body's ability to cool itself. To determine the effect of both heat and humidity, the National Weather Service formulated the heat index based on the average range of warm-season conditions.
Heat Wave: In Massachusetts, at least three consecutive days above 90°F.
Heat Advisory: Issued by the National Weather Service when daytime heat indices of 100ºF–104ºF for two or more hours.
Humidity: A measure of how much water vapor is in the air.
Land Surface Temperature: A measure of the temperature of the surfaces, including land, pavement, and rooftops, often measured by satellite imagery.

Section 2. Understanding Climate-Driven Heat in Metro Boston

Historically, Metro Boston's climate has been characterized by cold, snowy winters, and humid summers with few extreme heat days (on average experiencing up to 11 days over 90). The region's spring and fall tended to be on the cool side. As climate change impacts local and regional weather patterns, the region's summers are becoming hotter, and spring and fall are also warming. In 2021, Metro Boston experienced several heat waves and about 25% more heat days than average,[8] as well as the wettest July in over 100 years.[9] In the recently published climate report by the Greater Boston Research Advisory Group (GBRAG), researchers show that by 2030 the region will experience between 12-27 days of extreme heat depending on global greenhouse gas (GHG) emissions. By 2080, that number could be upwards of 80 days over 90 degrees. Climate science also predicts the region an average daily temperature will increase by between 2.5-3 degrees F by 2040.[10]

In addition to the increasing extreme heat and rising temperatures due to climate change, the region is also impacted by Urban Heat Island (UHI) effect. UHIs are areas that experience hotter temperatures than surrounding areas, due to the development in the area, materials used, and lack of trees and green space.[11] Buildings, roads, and other concrete and metal structures absorb heat during the day and -emit heat at night, causing night temperatures to cool off less well than surrounding areas. The urban heat island effect ranges in scale from neighborhood to neighborhood to city-wide to regional. Even in a suburban area, a shopping plaza with large amounts of exposed pavement will cause a localized heat island.

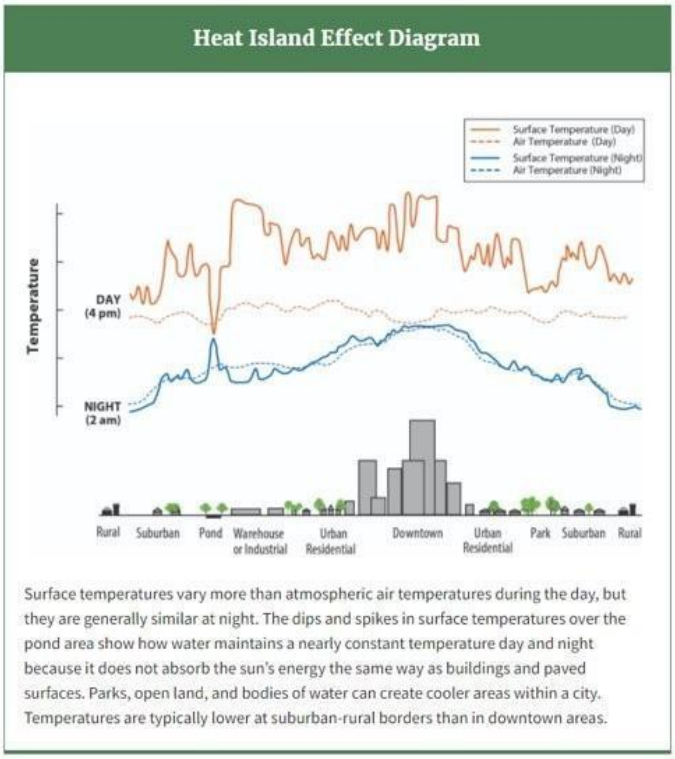


Figure 1. Learn About Heat Islands | Source: US EPA

Areas with more dense development and lack of trees and green space experience hotter temperatures than do surrounding suburban areas. This causes huge disparities and inequalities in how people experience extreme

[8] "With Another Day Above 90, Boston Heatwave Becomes Official" August 13, 2021. https://www.wbur.org/news/2021/08/13/heat-wave-boston-weather-warming

[9] "In Boston, first week of July has been wettest in over 100 years" July 7, 2021. https://www.bostonglobe.com/2021/07/07/metro/boston-first-week-july-has-been-wettest-over-100-years/

[10] "Heat, sewer problems and less lobster: New report details climate change's impact in Boston" June 1,2022 https://www.wbur.org/news/2022/06/01/gbrag-report-climate-change-greater-boston

[11] "Learn About Heat Islands" Environmental Protection Agency (EPA) Learn About Heat Islands | US EPA

heat. UHIs combined with climate driven heat and increasing development in the region means that the challenge is getting worse.

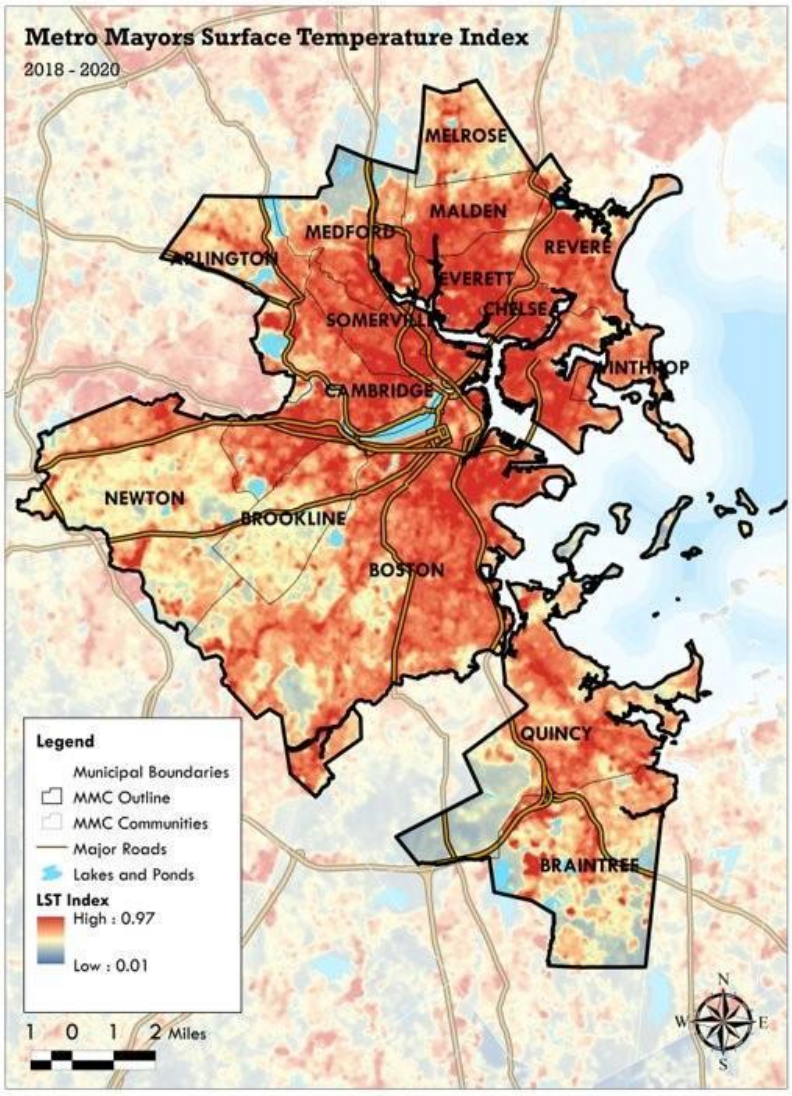


Figure 2. Land Surface Temperature Index in the Metro Mayors Region. Source: MAPC

Land Surface Temperature (LST) Index (2018-2020) This map shows areas with higher land surface temperatures that contribute to urban heat island effect in Metro Boston. This map was developed using a composite of land satellite images of high heat days between 2018-2020 combined with land cover maps to develop an index that shows areas of relatively high land surface temperature (LST). The LST index can be used as a planning tool to inform development, open space, and green infrastructure priorities. However, because of factors such as wind velocity, direction, water bodies, humidity, and others- it is not a perfect proxy for air temperature or heat index.

In the Boston Metro region, many areas predominantly home to low-income residents and people of color lack adequate green space, street trees, and other cooling features due to a long history of disinvestment. However, even wealthier neighborhoods experience urban heat islands, but may be more able to adapt to the increased heat exposure due to access to cooling in their homes and workplaces.

Extreme Heat and Public Health: The Impact of Rising Temperatures on Health Across Six Social Determinant Pathways

The conditions in which we live, work, learn, and play – the **social determinants of health** - influence how we experience climate-driven heat. They can buffer climate impacts by providing us a means to cope or adapt to our changing environment. Conversely, they can also amplify climate impacts, especially among communities that have been subjected to structural racism and other inequities. As part of the planning process, MAPC identified six social determinants of health pathways through which people experience climate-driven extreme heat impacts: **Social Connections, Education, Employment, Housing, Open Space and Recreation, and Transportation**. For each pathway, a brief literature review was conducted, and findings summarized in short memos. These research briefs helped inform our assessment of interventions to address climate-driven heat and development of strategies and actions contained within the plan.

Most heat deaths occur within people's homes. Risk factors for indoor heat exposure include poor access to indoor cooling, high energy cost burdens, occupant behavior, lack of enforceable temperature standards, building characteristics, and the building's location.

Hazardous workplace heat exposures can occur both outdoors and indoors. Heat stress killed 815 U.S. workers and seriously injured more than 70,000 people between 1992 and 2017. Heavy physical activity, high humidity, clothing and personal protective equipment that holds in body heat, and radiant heat sources, such as ovens, furnaces, and open fire all increase heat health risks for workers.

Green spaces help cool neighborhoods through shading and evapotranspiration in addition to promoting physical activity, social interaction, and improved mental health. On the flip side, playgrounds with artificial materials and little shade have some of the highest surface temperatures within urban areas.

High temperatures impair learning and academic performance, especially among students of color and students in lower-income districts. As of 2017, only about a quarter of Boston Public Schools had central air conditioning. Many other schools across the region have had to cancel classes due to recent heat waves.

Social connections facilitate access to information, social and physical support, and group action to mobilize heat solutions. Older adults, people with mental or behavioral health issues, and people experiencing homelessness are less likely to have connections to rely on for support or information during an extreme heat event.

Extreme heat can discourage people from choosing active travel modes and expose walkers, cyclists, and transit riders to unsafe temperatures and air pollution. It can also disrupt transportation infrastructure, increasing trip delays and collisions.

Different people react differently to heat based on their age, health, and living conditions:[12]

- **Infants and young children under age 5** are more susceptible to heat stress because they are less able to regulate their body temperature compared to adults. They are also more dependent on caregivers for access to water, shade, and cool spaces.
- **Older adults, particularly those over 65** are less able to regulate their body temperatures compared to younger adults. Certain medications, including many that are commonly taken for heart conditions, also make it harder to cool down and stay hydrated.
- **People who are pregnant** are more sensitive to heat because their bodies are already at an elevated temperature and heart rate. They are also more prone to dehydration, which can trigger pregnancy complications. ,
- **People with pre-existing health conditions,** such as heart, respiratory, kidney, and mental and behavioral health conditions are more sensitive to heat. Many medications also interfere with the body's ability to regulate body temperature and may cause dehydration more easily.
- **Socially isolated individuals.** Social, cultural, and linguistic isolation are all risk factors for heat illness because they limit access to information, resources, and social and emotional support systems.
- **People who work in hot environments and athletes.** Dangerous heat exposure can occur in both outdoor and indoor environments. Heavy physical activity, lack of acclimatization, and heat-trapping uniforms or clothing can increase risks of heat illness.[13]
- **People who primarily take public transit.** Those who may be walking or waiting in line outside for transit, work, or essential services are more at risk for heat exposure and illness.

Heat affects everyone, but some people are at greater risk.

[12] Union of Concerned Scientists (2019). Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days. https://www.ucsusa.org/sites/default/files/2020-12/UCS_extreme_heat_report_190712b_low-res_corrected12-20.pdf

[13] OSHA (2020). Safety and Health Topics: Heat. https://www.osha.gov/heat-exposure; National Institute for Occupational Safety and Health (2018). Heat Stress – Heat Related Illness: Types of Heat-related Illnesses. Centers for Disease Control and Prevention. https://www.cdc.gov/niosh/topics/heatstress/heatrelillness.html

- **People without air conditioning or with high housing cost burdens.** Few New England homes have central air conditioning, and low-income households are less likely to have air conditioning. Landlords are not required to guarantee access to cooling in the same way that the law requires them to provide access to heat in the winter. There are also few financial resources available to help people absorb higher summer cooling costs.
- **People who live in urban heat islands.** Structures such as buildings, roads, and parking lots absorb and release the sun's heat more than natural landscapes like forests and water bodies do. The concentration of these heat emitting surfaces in urban areas combined with fewer green spaces contributes to the urban heat island effect.

Disparities in Exposure and Risk from Extreme Heat

People's experiences of heat largely depend on where they live. Low-Income residents and Black, Indigenous, and People of Color and experience the greatest heat burdens resulting from a historic and ongoing disinvestment and discrimination. Neighborhoods that are poorer and have more residents of color can be several degrees warmer than wealthier, whiter neighborhoods in the same city. A long history of disinvestment in these communities have resulted in poor access to green spaces and fewer trees to shade homes and sidewalks. Instead, large areas of pavement characterize these neighborhoods. Roads, parking lots, and the industrial and warehouse facilities that are also disproportionately located in these communities absorb and slowly re-emit heat, contributing to the heat island effect.

Black, Indigenous, and People of Color are also disproportionately represented among several of the groups listed below. They are more likely to depend on public transit and occupy poor-quality housing. They are more likely to have pre-existing health conditions, poor access to healthcare, and experience discrimination by healthcare providers. For example, black and brown people are disproportionately exposed to higher-than-average air pollution levels, leading to disparities in health impacts. If unabated, climate-driven heat will widen these already large health disparities.[14]

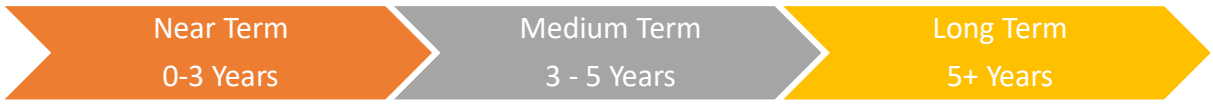
These inequities are not accidental. They are the outcomes of disinvestment and discrimination that continue to influence disparities in heat impacts today. Discriminatory policies and practices that are designed to ensure public spaces are easier to surveil and maintain, meet the aesthetic preferences of white residents, and discourage loitering among people experiencing homelessness are barriers to equitable access to trees, water, shade, and other cooling infrastructure and resources.[15]

[14] Human Rights Watch (2020). US: Heat Emergency Plans Missing Pregnancy, Racial Justice. https://www.hrw.org/news/2020/10/23/us-heat-emergency-plans-missing-pregnancy-racial-justice

[15] Sam Bloch. (2019) Shade. Places Journal. https://placesjournal.org/article/shade-an-urban-design-mandate/

Section 3. A Roadmap for Action: Priority Strategies and Actions for Municipalities and the Region

This section of the plan is meant to provide an actionable roadmap for the municipalities and regional collaboration within the Metro Mayors area. Many of the actions can be taken by the municipality, whereas others will require regional or State collaboration. These strategies and actions are meant to provide a regional and municipal level roadmap for the next 5-7 years, with actions both in the near term and mid-term.



The plan should be assessed/updated every 5 years

Cool Communications: Actions to improve communications about extreme heat before, during, and after heat events to shift behaviors to prevent heat health impacts and increase resilience.

Cool Communities: Actions to strengthen and mobilize social connectedness and support in service of community heat preparedness.

Cooling Our Homes and Buildings: Actions to reduce exposure and heat risk through cooling our homes and buildings.

Cooling Our Blocks: Actions to reduce exposure and heat risk through reducing heat disparities in our neighborhoods, as well as providing access to outdoor cooling.

Cooling Our Region: Actions best suited for regional collaboration including advocacy through Metro Mayors, shared services/procurement, and data collection and analysis.

Emergency Response: Actions associated most closely with responding to a heat emergency, either in the immediate lead up, during, or right after a heat emergency.

Note that some actions may belong in multiple categories, such as communications, or help accomplish multiple goals.

Cool Communications

Communications, education, engagement, and outreach play a critical role in developing a heat resilient region and shifting both individual and community level behavior to better tackle extreme heat. As a region, we must continue to build awareness that extreme heat is increasing and that it causes health, social, economic, and other impacts. As communications strategies can also elevate the importance of heat resilience to local, State, and Federal decision-makers, they must be an important element in our advocacy work.

Strategy 1. Develop a regional heat-health warning system based on emerging best practices.

Current heat-health warnings are based on National Weather Service (NWS) alerts including factors like excessive heat watches, advisories, and warnings depending on the forecast and conditions. The current threshold for Massachusetts for a heatwave is 3 days over 90 degrees: however, the "real feel" be much higher due to humidity levels. In 2017 the Northeastern Regional Heat Collaborative, comprised of Northern New York, Vermont, New Hampshire, and Maine lowered their heat thresholds due to the unique vulnerability of their populations and preparedness for heat.[16] Under their recommendation the heat thresholds for those Northeastern States were lowered and began issuing a heat advisory when the Heat Index values of 95-104 F for 2 or more consecutive hours occurred. The current Heat Advisory criteria for Massachusetts is when heat index values are 100-104 F for 2 or more hours. Some municipalities, like the City of Boston, have adjusted their thresholds and expanded communication efforts ahead of and during a heat event. In Boston a Heat Advisory is declared when a heatwave is in effect at the 90-degree threshold for 3 consecutive days.

A. Near term municipalities may adjust their heat thresholds for communications and emergency management to be in line with City of Boston's.
B. Coordinate with National Weather Services to adjust heat thresholds for the region that more adequately reflect when health outcomes are triggered.
C. Pilot regional novel heat-health warning messaging approaches, such as naming and ranking severity of heat waves.
D. MAPC to develop template resources for municipalities and partners to communicate the risk to the public using diverse notification methods, including media advisories, municipal websites, social media, telephonic alerts such as robocalls/reverse 411, text alert systems, digital billboards, and roadway message boards.

Implementation Scale	Regional and State
Implementation Timeline	Near to medium term
Implementation: Leaders and Partners	Municipal Public Health and Emergency Management Departments National Water Service, Massachusetts Emergency Management Association, Massachusetts Department of Public Health MAPC

[16] "National Weather Service is Lowering Heat Advisory Thresholds for Northern New England and Much of New York" National Weather Service (NWS) NEWHeatThresholds.pdf (weather.gov)

Equity Considerations	• Current heat thresholds may not fully encompass the health risks to older adults and aging MA populations. • Communication avenues should consider different forms of media and include multi-language translation. See Strategy 3 about culturally sensitive resources.
Examples/Resources:	• **The Northeastern Regional Heat Collaborative** worked with National Weather Service to use heat-health metrics to determine a lower-threshold for heat advisories in NY, NH, VT, and ME.[17] • **The Extreme Heat Resilience Alliance** is working on piloting naming and ranking heatwaves in two cities: Athens, Greece and Seville, Spain.[18]

Strategy 2. Develop and implement extreme heat awareness campaigns to promote seasonal readiness throughout the hotter months (May through September).

While communications during a specific heat event can be critical, studies show that it has limited impact on shifting behaviors and limiting mortality and health emergencies.[19] It is important to educate and engage the public around extreme heat throughout the year, and in particular the summer months to raise awareness around personal and community-level ways to reduce risk.

A. Create a suite of actionable and targeted communications tools tailored to different audiences and trusted messengers (e.g., local governments, health professionals, meteorologists, employers and employees, senior services providers, educators, landlords and renters)
B. Provide training to support trusted community messengers and partners in awareness campaigns and use of communications tools
C. Continue to partner with municipalities, community-based organizations, and State agencies to highlight heat preparedness during May in "Heat Prep Week"

Implementation Scale	Regional and Municipal
Implementation Timeline	Near term
Implementation: Who leads/who partners	Municipal Public Health, Communications, School Department, Senior Services, Family and Children Services, Parks and Recreation, Library Departments

[17] NEWHeatThresholds.pdf (weather.gov)
[18] Extreme Heat Resilience Alliance: Reducing Extreme Heat Risk - Arsht-Rock (onebillionresilient.org)
[19] Toloo, G. et al. (2013). Evaluating the effectiveness of heat warning systems: systematic review of epidemiological evidence. International Journal of Public Health. 58(5):667-81. https://pubmed.ncbi.nlm.nih.gov/23564031/

	MAPC MA Department of Public Health
Equity Considerations	• Language access and translation • Creative, interactive, culturally responsive, and engaging methods to present and share information so that it is easy to understand • Funding for non-profit and community-based partners to participate in training or work related to outreach and engagement should be scoped into projects
Examples/Resources:	• Existing resources: Extreme Heat Communications Resources – MAPC (Note- this toolkit is currently being updated). • Heat Prep Week: 2021 Heat Preparedness Week 2021: Take Action Today – MAPC • Heat Prep Week 2022: Heat Preparedness Week 2022: Take Action Today – MAPC

Strategy 3. Develop culturally and linguistically inclusive communications for frontline communities who are disproportionately impacted by the effects of extreme heat.

The Metro Mayors region is a culturally and linguistically diverse region, with some of the communities having large communities of BIPOC, immigrant, or non-English speakers. Municipalities should continue to partner with community-based organizations and artists on education, outreach, and communications.

A. Engage frontline communities, including artists and local cultural groups, in the co-creation of communication tools and outreach strategies.
B. Partner with local community-based organizations and trusted messengers in frontline communities to deliver information on resiliency in a community-focused manner.
C. Assess language access needs and ensure adequate translation and interpretation capacity across all extreme heat communications and service touch points.

Implementation: Scale	Regional
Implementation: Timeline	Near term
Implementation: Who leads/who partners	Municipal Public Health, Community Engagement/Outreach, Arts and Culture, Parks and Recreation, Library, School Department, Community-based organizations, cultural organizations, immigration advocates and service providers, faith-based organizations MAPC
Equity Considerations	• Project scopes for outreach should include adequate budget for engaging and partnering with local organizations and artists, including funding participation in focus groups.

	• Develop communication materials in partnership with communities. • Translation and interpretation should be provided.
Examples/Resources	• **Artists and Public Health Communications-** In 2021, MAPC partnered with and funded artists to develop creative COVID-19 communications materials including print, video, and other mediums. Creative COVID-19 Communications – MAPC • **Cool it with Art Guide-** MAPC also developed a guide to promote creative and art-based approaches to cooling infrastructure Cool it with Art – MAPC

Cool Communities

Connection and social cohesion are critical to developing heat resilient communities and positive public health outcomes. Community connections facilitate access to information, social and physical support, and facilitate group action to address collective problems. Extreme heat events can cause people to isolate themselves in their homes and limit interpersonal interactions. Ironically, social isolation also increases vulnerability to heat-related health impacts, particularly for older adults or people with disabilities who may be less able to obtain resources to prepare for extreme heat. Social isolation and extreme heat exposure can collectively worsen health risks such as depression, anxiety, and heart and respiratory dysfunction. People with pre-existing health issues, such as chronic and mental illness and substance use disorder are predisposed to experiencing social isolation. The actions in this section are aimed at increasing and strengthening community connection and social cohesion, particularly related to heat resilience.

Strategy 1. Establish a Community Climate Corps program to build the capacity of frontline community residents to lead outreach, mutual aid, and advocacy activities related to extreme heat and other climate-health risks. Climate Corps members can support both seasonal readiness (e.g., educational outreach, distributing cooling resources) and heat event response activities (e.g., performing wellness checks with higher risk individuals).

A. Develop heat preparedness training modules and materials for community corps members and other trusted messengers.
B. Establish sustainable funding models to recruit, train, and pay community corps members and to administer the climate corps program in alignment with and through other community organization-led heat resilience efforts year after year.

Implementation Scale	Neighborhood and Municipal
Implementation Timeline	Near term
Implementation Leaders and Partners	Municipal Public Health, Community Engagement, Parks and Recreation, Library Community-based organizations, cultural organizations, faith-based organizations MAPC
Equity Considerations	• Successful Corps programs pay their resident members, providing well-paid part-time work. • Having low entry barriers is important to assembling a group that will be effective at connecting with the community.

	• Successful corps programs have had representation from correctional systems-impacted individuals, under-employed workers, and immigrants.
Examples/Resources	• **Cambridge, MA - The Cambridge Community Corps**[20] conducts public health-focused outreach, education, and advocacy. The Corps focus has been on COVID-related communications and mutual aid since its inception, but the Corps also supports other public health-aligned community initiatives. • **New Orleans, LA - The New Orleans Resilience Corps**[21] is a "culturally competent and accessible health care and jobs program designed to support immediate and long-term recovery for communities most impacted by the pandemic."[2] The program leverages learnings from climate disaster response and federal workforce development funds to train under-employed and laid-off people in community health outreach practices.

Strategy 2. Establish a model and reliable funding stream to support community resilience hubs to improve heat resilience as well as address other climate hazards.

Resilience hubs are community-serving facilities, such as neighborhood centers and religious buildings, which are managed by trusted community institutions and used for gathering year-round. They can be leveraged as "hubs" of information, shelter, training, and resource distribution before, during, and after emergency events. There are several different models of resilience hubs, including those managed and funded by municipalities.

A. Support community-led processes to identify and strengthen community resilience hubs, including planning for services and programming, training for staff and volunteers, and planning for building level improvements, including to ensure reliable access to power during outages.
B. Establish partnerships, with monetary support, between local government and organizations managing resilience hubs to facilitate training, communication, coordination, and resource distribution before and during heat events.
C. Establish local funding streams, identify additional funding sources, and provide funding application technical assistance to unlock resources for resilience hub operation and capital investments, including connection to a microgrid or other sustainable back-up energy supply.

Implementation: Scale	Neighborhood, Municipal, and Regional

[20] City Launches Cambridge Community Corps to Encourage Residents to Adopt Safe Practices While Outdoors - City of Cambridge, MA (cambridgema.gov)
[21] Resilience Corps – Resilience Force

Implementation Timeline	Medium term
Implementation: Who leads/who partners	Municipal Public Health, Emergency Management, Finance Local community-based organizations, service providers, non-profits, faith-based organizations/houses of worship
Equity Considerations	• Successful resiliency hubs are inclusive community spaces - physically accessible, free to enter and stay, welcoming to people of all ages and identities, and have the trust of the community.
Examples	• **Medford, MA Resilience Hubs** – The City holds monthly check-ins with local organizations to explore how the City can support CBO efforts. The City is in the process of making an operation plan to outline municipal and CBO roles, focus on partnering with existing organizations. In the next round of the MVP grant, Medford will be looking to formalize partnerships with the goal of having a resilience hub in every neighborhood that is part of the larger network. To accomplish this Medford is conducting site assessments, sending out communications, and assessing potential needs. • **Baltimore, MD - The Community Resiliency Hub Program**[22] is a partnership between local groups and the city's Office of Sustainability (BoS), Office of Emergency Management (OEM), and Department of Health (BCHD). Resiliency Hubs have acted as cooling centers during heat waves, distributed water bottles and fans for residents without air conditioning, provided sandbags in flood-prone areas, provided charging stations during power outages, and "served as post-disaster recovery staging areas for emergency and recovery personnel to meet with residents in need of assistance." Resiliency Hubs have also distributed food and hosted testing and vaccination clinics during the COVID-19 pandemic.

Strategy 3. Support efforts among healthcare providers, health educators, and caregivers to screen and connect individuals at higher risk for heat-health impacts to prevention resources.

A. Engage health professionals in local heat emergency and adaptation planning.

[22] The Baltimore City Community Resiliency Hub Program | Baltimore Office of Sustainability (baltimoresustainability.org)

B. Develop and provide training for health professionals on heat health risks and prevention measures.
C. Support pilot projects within healthcare to develop and utilize screening tools, patient education materials, and referrals to connect patients to heat-health impact prevention resources. This support may consist of sharing data, facilitating connections to municipal and community service provides, and hosting spaces for shared learning.

Implementation: Scale	Municipal and Regional
Implementation Timeline	Near to medium term
Implementation: Who leads/who partners	Municipal Public Health and Emergency Management Departments, MAPC Healthcare Providers including Hospitals and Clinics
Equity Considerations	• Target is to secure benefits of heat adaptation planning for people most at risk of experiencing heat-related health impacts, including people with pre-existing health conditions, people with disabilities, older adults, pregnant people and infants
Examples	• **Boston, MA-** For the past two years, Roxbury-based Garrison-Trotter Neighborhood Association (GTNA) has partnered with Boston Medical Center (BMC) and Climate Ready Boston (CRB) team in the Boston Environment Department to connect residents who are experiencing heat related illness with indoor cooling resources to prevent recurring cases. • **Somerville, MA - Keep Cool Somerville** is an initiative to improve community resilience to heat that began 2020 with research and engagement focused on understanding heat preparedness strategies and the impact of extreme heat on Somerville residents. Health professionals have been consistently engaged in the initiative. Staff from Cambridge Health Alliance (CHA) and the Somerville Health and Human Services Department sit on the Advisory Committee. CHA healthcare providers and Somerbaby home visiting program staff participated in interviews and focus groups. In 2021, the initiative funded community-led pilot projects to address heat impacts. Again, a CHA healthcare provider hosted a heat health learning session with one of the community grantees. • **New York City, NY - As part of its Cool Neighborhoods NYC Plan,**[23] the City partnered with three home care agencies to promote heat and climate-health information. The agencies will use their

[23] Cool_Neighborhoods_NYC_Report.pdf

	continuing education curriculum to educate nearly 8,000 home health aides on climate-related risks and to recognize early signs of heat related illness. The curriculum has since been used to train other trusted messengers.

Strategy 4. Develop and disseminate heat-health training and resources for employees and employers in alignment with existing worker advocate-led efforts.

A. Conduct outreach to employers, with a focus on smaller employers and those employing vulnerable worker populations, to inform them about extreme heat risks, applicable regulations, and resources for assistance in minimizing risks.
B. Strengthen partnerships with worker centers, labor unions, and other groups representing and serving workers in higher risk occupations to co-develop educational materials and heat-health prevention resources. Ensure engagement efforts are inclusive of independent contractors, such as housekeepers, caregivers, and day laborers.
C. Develop and implement model policies and communications to protect municipal workers from extreme heat impacts that could be adopted by other sectors. Ensure communications are linguistically inclusive and include communications to residents on impacts on services during heat events.

Implementation: Scale	Municipal and Regional
Implementation: Timeline	Near to medium term
Implementation: Who leads/who partners	Municipal Public Health, Public Works, Emergency Management, Economic Development Business Councils/Associations, Chamber of Commerce, Massachusetts Coalition for Occupational Safety and Health (MACOSH), Occupational Safety and Health Administration (OSHA), labor organizations and Unions,
Equity Considerations	• Opportunity to engage people doing this work on two-way knowledge sharing. Many workers coming from hot climates can tap into that expertise and culturally relevant strategies.
Examples	• MassCOSH provides extreme heat related trainings and response to workers, available in English and Spanish.[24]

Strategy 5. Deploy targeted actions to meet the heat resilience needs of unhoused populations.

A. Support the inclusion of Continuums of Care, shelter providers, homeless services organizations, and people experiencing homelessness in local heat emergency and adaptation planning efforts. Continuums of care is a program under the Department of

[24] Stressing the Need for Heat Safety | Massachusetts Coalition for Occupational Safety and Health (masscosh.org)

Housing and Urban Development (HUD) and provides funding to non-profit providers, local and state governments to rehouse homeless individuals and families while minimizing the trauma that dislocation can have on homeless individuals and families.

B. Identify and disseminate information on best and emerging practices to guide Continuums of Care, shelter providers, emergency response professionals, and municipalities in building capacity to address the needs of the unhoused populations during extreme heat events.
C. Partner with shelter providers and homeless services organizations to distribute cooling kits and deploy portable water stations to shelters and sites frequented by people experiencing unsheltered homelessness during warmer months.
D. Support shelter providers in extending hours and services during extreme heat events, including by allocating funding for additional staffing.

Implementation: Scale	Municipal and Regional
Implementation: Timeline	Near to medium term
Implementation: Who leads/who partners	Municipal Public Health and Emergency Management Departments Shelter providers and advocates
Equity Considerations	• Unhoused people are among the most vulnerable to heat. Connecting with unhoused populations by sheltering or distributing cooling kits can make the difference between life or death.
Examples	• **Winnipeg Extreme Heat Response Plan:** A homeless-centered guide to keep Winnipeggers safe during extreme heat.[25]

[25] Extreme-Heat-Response-Plan-2019.pdf (endhomelessnesswinnipeg.ca)

Cooling Our Homes and Buildings

While outdoor heat is important to tackle, many people also experience higher temperatures in their homes, schools, places of employment, and other buildings. Buildings in Massachusetts have historically been designed and built to withstand cold winters. Many aging buildings and homes lack appropriate weatherization for both cold and hot weather, which means that occupants are spending more energy and money to heat and cool their homes than they should be. Many buildings lack air conditioning, and even fewer have central air conditioning or air source heat pumps (ASHPs) that provide both clean heating and cooling. Even if a home does have access to air conditioning (AC), residents may be unable to afford to run their AC due to high electricity and utility costs. Additionally, many municipal buildings and schools – whether they are historic buildings or not- also have limited or no air conditioning. Helping people cool inside- while at home, school, or work- is critical to reducing mortality and morbidity during extreme heat events.

Strategy 1. Adapt existing buildings (residential, commercial, and institutional) to be more resilient and energy efficient to better withstand extreme heat, provide cooling, and reduce energy usage and costs.

A large percentage of existing homes and buildings will need to be weatherized and retrofitted for the purposes of reducing energy usage, meeting greenhouse gas (GHG) reduction goals in the Commonwealth and the MMC region and enhancing resilience to extreme weather. Low- and moderate-income (LMI) households will need the most financial and technical support to ensure that costs do not exacerbate their energy burden.

Municipalities can provide support and connections to existing state and utility programs, as well as adopt local policies that require or incentivize property owners to invest in efficiency and resilience. Policies should be implemented in the near term, with implementation extending over the medium and long term.

A. Connect and educate residents about existing State resources and programs, such as MassSave, Fuel Assistance, Rebates, and Utility Discounts. Work with the State to expand and support weatherization, and energy efficiency programs for LMI households including addressing barriers to adoption.
B. Reduce barriers and increase financial incentives for clean heating and cooling, including for - and air- district energy, and energy storage.
C. Establish a municipal building energy use disclosure program to incentivize and require energy efficiency improvements in large-scale buildings. More energy efficient buildings can help save on energy costs, and weatherization can improve resilience to extreme temperatures.
D. Establish a municipal rental licensing program with heat safety standards built upon the sanitary code with energy disclosures to ensure that landlords are providing heat-safe and healthy units to renters (see Sanitary Code below in Cooling the Region).

Implementation: Scale	Municipal and State
Implementation: Timeline	Near to medium term

Implementation: Who leads/who partners	Municipal Planning and Community Development, Sustainability and Climate, Inspectional Services, Electric utilities, including Municipal Light Plant (Note- Braintree has an MLP), MassSave, Massachusetts Association for Community Action (MassCAP) and regional Community Action Agencies who work as program administrators Mass Clean Energy Center (MassCEC) MAPC
Equity Considerations	• Increase advocacy for equity and access in the State and Federal existing energy efficiency and clean energy programs • Consider how to prevent displacement during and post renovations; ensure tenants do not bear the cost burden of improvements. • Establish financial support for Environmental Justice (EJ) census blocks/LMI with that do not displace current residents.
Examples/Resources:	• **Toronto, Ontario, Canada "Hot Weather Plan for Landlords"** developed a set of resources for landlords that helps them create a hot weather plan for their tenants. This includes designating an AC room open to tenants for cooling, notifying tenants and sharing information, arranging for building staff to check on vulnerable tenants, and keeping hallway windows open.[26] • **Philadelphia, PA "EnergyFIT Philly**" program worked with entire neighborhoods to retrofit homes, most of which were rejected from standard weatherization programs due to their poor physical condition. This program served more than 70 low-income homes in its 3 years of operation. [27]

Strategy 2. Ensure that new construction, renovations, and retrofits of existing housing and commercial buildings are resilient and energy efficient, including regarding extreme heat.
In addition to policies that ensure robust energy efficiency and resilience in new construction, enacting policies that promote retrofitting existing buildings are crucial as current buildings make up the majority of the building stock. This includes in the buildings themselves, as well as site-level actions, such as green infrastructure, which can reduce heat exposure, solar load on

[26] Hot Weather Plan for Landlords – City of Toronto
[27] J., M., A., D., & B., H. (2021). *EnergyFit Philly Retrofits Entire Blocks of Low-Income Housing*. American Council for an Energy Efficient Economy. https://www.aceee.org/sites/default/files/rtg/case-studies/EnergyFIT%20Philly%20Case%20Study.pdf

buildings, and increase cooling. Policies should be developed and implemented in the near term that will have impacts over the long-term on the built environment.

A. Municipality adopt zoning and design standards to require and incentivize heat resilience, such as a Green Factors Score, Cool roof requirements, parking minimum reductions, and shade requirements for parking.
B. Municipality adopt site development standards and design guidelines for trees, plantings, porous pavement/impervious surface, and soil quality.
C. Municipality adopt the State's new specialized net zero building code, to be available for adoption by the end of 2022, and continue to improve upon and enforce the code.
D. Develop State goals for renewable thermal and improve State incentivizes for clean energy technology for heating and cooling (such as renewable thermal, district energy, etc...).
E. Support market development and expansion of renewable energy, energy efficient, clean heating and cooling, and cool building materials such as cool roof materials. Through incentives, partnerships with distributors/contractors etc...

Implementation: Scale	Municipal, Regional, and State
Implementation: Timeline	Near to medium term
Implementation: Who leads/who partners	Municipal Planning and Community Development, Sustainability and Climate, Inspectional Services, Boards including Planning Board, Conservation Commission Zoning changes will need to be approved by City Council or Town Meeting Mass Department of Energy Resources (DOER) Municipal Vulnerability Preparedness (MVP) Program Mass Clean Energy Center
Equity Considerations	• There are concerns about rising costs of housing and how impacts of new standards or requirements may be passed onto renters or displace them from their homes, in particular low-moderate income households. These can be mitigated through anti-displacement and rental licensing policies. • Financial incentives and requirements should be structured in ways that lead towards equitable outcomes for LMI residents.
Examples	• **Somerville, MA- Green Factors Score-** Adopted as part of an overall zoning update to form-based code, the Green Score ordinance is a performance-based landscape standard that incentivizes

	sustainable and resilient site-based elements (See 10.4 Green Score).[28] • **Somerville, MA Net Zero Pathways-** Integrates building performance guidelines and standards within the development review process that. [29] • **Cambridge, MA Cool Factors Code-** proposed zoning code includes performance standards for site and building based elements that contribute to cooling and heat resilience.[30] • **Watertown, MA-** "proposed developments shall seek to diminish the heat island effect; employ passive solar techniques and design to maximize southern exposures, building materials, and shading; utilize energy-efficient technology and renewable energy resources; and minimize water use." As part of this requirement, projects must be LEED silver certifiable.[31]

Strategy 3. Ensure public facilities, schools, and other critical community facilities are resilient to extreme heat and provide access to cooling.

Municipalities own and manage a wide range of public facilities and buildings such as administrative offices, schools, libraries and community centers. Typically, libraries, schools, senior centers and community centers also act as cooling centers or shelters during a heat emergency. All fifteen MMC municipalities are designated Green Communities and track energy usage and building improvements across their municipally owned building stock. Municipalities can continue to lead by example by focusing on weatherization, energy efficiency, and installing clean heating and cooling such as air-source heat pumps.

A. Assess public buildings, including schools that have/need cooling and prioritize clean heating and cooling systems and weatherization. Connect with programs on improvement ventilation and indoor air quality, particularly in school settings.
B. Identify and equip community centers (such as libraries and senior centers) and schools that can be used as cooling centers or resilience hubs in the case of extreme weather, including extreme heat. Ensure locations have back-up power either through solar+storage or a generator for critical loads with the ability to island in the case of a power outage.
C. Train municipal staff at these locations in heat preparedness and heat-health 101.

Implementation Scale	Municipal and State

[28] City of Somerville "Somerville Zoning Ordinance" Last amended Dec. 9th, 2021. 2021-21-31-Somerville-Zoning-Ordinance.pdf (netdna-ssl.com)

[29] Somerville Climate Forward | City of Somerville (somervillema.gov); www.somervillezoning.com/developmentreview.

[30] 20220216_CRZTF_Report_Final.pdf (cambridgema.gov)

[31] City of Watertown, MA Zoning Code (ecode360.com)

Implementation Timeline	Near to medium term
Implementation Leaders and Partners	Municipal Department of Public Works, School Department, Senior Services, Family and Children Services, Housing, Library, Public Health, Emergency Management, Finance, Planning and Community Development, Sustainability and Climate Massachusetts School Building Association (MSBA), Department of Energy Resources Green Communities Division, MassSave, MassCEC
Equity Considerations	• Many low-moderate income households rely on community centers for a range of services, including cooling even when it is not a formal cooling shelter. These spaces should be equipped to serve the community, including translation and interpretation, programming to engage residents, and accessibility.
Examples	• **Arlington, MA: Facilities Electrification and Air Quality Master Plan** for municipal facilities and schools. While the driver of this work is to support reaching municipal net zero goals, it also has added resilience and public health benefits. [32] • **Boston, MA: A Green New Deal for Boston Public Schools** is a cross-departmental effort to improve Boston's public-school buildings and facilities. As part of the program, BPS has developed a Building Dashboard and a Facilities Condition Assessment.[33] • **Philadelphia, PA: Green School Yards** as part of the City-wide Green City, Clean Water efforts, they have retrofitted school yards to provide stormwater benefits, health, and other co-benefits.[34]

[32] RFP 637612416674070000 (arlingtonma.gov)

[33] A Green New Deal for Boston Public Schools | Boston.gov; Green New Deal / A Green New Deal for BPS (bostonpublicschools.org)

[34] Green City Clean Waters – Philadelphia Water Department; 547129531651180934-collaborative-transforming-philadelphias-schoolyards-guide.pdf (cdesignc.org)

Cooling Our Blocks

Although climate change will increase temperatures throughout the entire Metro region, some neighborhoods already experience disproportionate exposure to extreme heat due to urban heat island effect.

The strategies outlined in this section focus on actions to reduce urban heat island effect, as well as ways to provide cooling, shading, and heat relief in public spaces. While green infrastructure and nature-based solutions are important measures, built infrastructure solutions, such as shade structures, cool pavement, cool roofs, and engineered cooling elements, will also be critical.

Strategy 1. Integrate heat resilience goals, standards, and guidelines into open space and recreation planning and improvements to existing open space.

Open space, such as parks, playgrounds, recreation fields, school yards, and other public facilities, provides an opportunity to enhance and increase heat resilience. Municipal Open Space and Recreation Plans (OSRPs) are updated regularly, and many have begun to include climate resilience priorities. In addition to adding trees, shade structures, and places for people to seek respite from the heat, increasingly municipalities are installing splash pads, hydration stations, and other water features. Splash pads are an accessible and safe way, for toddlers to older adults, to provide cooling opportunities for residents.

A. Establish and update municipal protocols for the date by which cooling services will begin each summer (I.e., water fountains turned on, shade structures up, pools open and staffed, splash pads turned on)
B. Provide guidance, methodology, and funding to municipalities to assess shading and cooling infrastructure at existing parks and open space and determine priorities for additional infrastructure.
C. Provide guidance and technical support on installing pop-up shade structures during the summer months.
D. Advocate for the State to establish a stream for heat resilience/cooling infrastructure, along with design standards and guidance.
E. Coordinate with Massachusetts Department of Conservation and Recreation (DCR) on state owned-recreation facilities and open space to ensure alignment on heat resilience priorities.

Implementation: Scale	Municipal and State
Implementation: Timeline	Near term
Implementation: Who leads/who partners	Municipal Parks and Recreation, Planning and Community Development, Department of Public Works, Youth Services, School Department, Conservation Commission, Sustainability and Climate, Public Health Massachusetts Department of Conservation and Recreation (DCR) Local non-profits

Equity Considerations	• Lower-income and BIPOC communities often lack access to open space and parks, or the spaces they do have are inadequate in terms of heat resilience. Equitable access should be factored into the assessment and prioritization of which parks and playgrounds to target for heat resilience.
Examples/Resources	• **10-Mins Walk Campaign:**[35] Mayors and City Managers make a commitment to "have safe access to a quality park or green space within a 10-minute walk from home by 2050." Led by Trust for Public Land (TPL), Urban Land Institute, and National Recreation and Park Association. • **Cool it with Art: A How-to Guide for Tackling Rising Temperatures with Art in Our Communities**[36] is an MAPC guide to promote creative approaches to address climate-driven extreme heat impacts, and to promote healthy, climate resilient communities. • **Plymouth, MA Open Space and Recreation Plan** integrated climate change and resilience into their planning process.[37]

Strategy 2. Develop municipal and regional connected networks of "cool corridors" that prioritize shade and green infrastructure to provide cooling and encourage active and public transit.

"Cool Corridors" are walkways, trails, pathways, and bike routes that are designed for those who walk, bike, or use public transit and provide respite from the heat and sun. Strategies may include green infrastructure, shade trees, and engineered shade structures. These routes may co-exist or run parallel to existing roadways, or be part of a trail, bike path, or rail-trail effort. Providing safe and accessible ways for residents to use multi-modal transportation generates multiple co-benefits including access to recreation, improved health outcomes, reduced GHG emissions from transportation, and increased transportation resilience in the event of an emergency (such as closures of the MBTA or roadways).

A. Update municipal Complete Streets policies to include heat resilience considerations such as street trees, shade structures, green infrastructure, cool pavement, and benches.

[35] 10 Minute Walk

[36] Cool it with Art – MAPC

[37] Town of Plymouth Open Space and Recreation Plan Addendum Climate Change Resilience (2021) jan_11_2021_plan_final_0.pdf (plymouth-ma.gov)

B. Review municipal zoning and policies that may be creating barriers for private investment in shade overhangs for municipal sidewalks. Barriers may include lot coverage requirements, setback requirements, and/or legal liability issues.
C. Collaborate with MBTA and community members to identify public transit stops (bus and above-ground rail) with prioritized need for shading/cooling and benches.
D. Collaborate regionally and across municipalities to identify key corridors that act as main travel routes for residents that should be prioritized for greening and cool infrastructure.
E. Establish municipal goals and policies to reduce heat from parking lots and structures, such as shade requirements.

Implementation: Scale	Municipal and Regional
Implementation: Timeline	Near to long term
Implementation: Who leads/who partners	Municipal Planning and Community Development, Transportation, Department of Public Works, Senior Services, Public Health, School Department Mass Department of Transportation (MassDOT) MBTA Active mobility and public transit advocates
Equity Considerations	• ADA compliance and access for users, consider • Prioritize under-resourced neighborhoods/urban heat islands • Public water fountains/hydration stations
Examples/Resources	• **Phoenix, AZ Cool Corridors Program and Policy Recommendations** were developed in 2021. The plan includes identification of key corridors to prioritize with tree planting and cooling efforts.[38] • **Medellín, Colombia 'Corredores Verdes'** established 30 interconnected corridors of greenery, including tree plantings along transit ways.[39]

Strategy 3. Ensure robust urban forest and tree canopy that provides cooling and shade benefits.

[38] Cool Corridors Policy Recommendations for Phoenix UHITS_2021 Apr 08.pdf
[39] Cities100: Medellín's interconnected green corridors (c40knowledgehub.org)

Urban forests and street trees provide many benefits to a community- can improve air and water quality, aesthetics, cooling through evapotranspiration, shading etc... However, urban trees can also be challenging to maintain and require adequate soil and water to survive and thrive. Ideal species of trees will also shift as our climate shifts.

A. Establish municipal policies, best practices, zoning, and design standards to protect, preserve, enhance, and plant trees on public and private property. and away from known gas leaks
B. Establish municipal policies to maintain and incentivize pervious/permeable surfaces – such as incentives for de-paving, stormwater utilities, or restrictions on paving yards.
C. Develop a municipal urban forest master plan then integrates climate and heat considerations. Include guidance for heat-resilient trees and plantings. Several communities have received MVP Action grant funding for these plans.
D. MAPC research and make recommendations on regional funding models and partnerships for additional trees, as well as maintenance of urban trees.

Implementation Scale	Municipal and Regional
Implementation Timeline	Near to medium term
Implementation Leaders and Partners	Municipal Planning and Community Development, Transportation, Department of Public Works, Parks and Recreation, Public Health, School Department, Water and Sewer Local non-profits and community-based organizations including Mystic River Watershed Association, Charles River Watershed Association, Trust for Public Land Massachusetts Water Resources Authority (MWRA), MA Department of Conservation and Recreation, Mass Department of Transportation MAPC
Equity Considerations	• Mitigate increased water costs for property owners in LMI/EJ areas • Cultural shift in thinking about trees providing multiple benefits, rather than just their maintenance costs/challenges (which has led to paving over yards etc...)
Examples/Resources	• **Cambridge, MA Urban Forest Master Plan:**[40] will guide the development of the urban forest into the future and will include a strategic plan to evaluate, maintain and expand the urban forest canopy while being more resilient to climate change, reducing the

[40] Urban Forest Master Plan - City of Cambridge, MA (cambridgema.gov)

	urban heat island effect, mitigating stormwater runoff, reducing nutrient runoff, and contributing to community well-being. The UFMP will coordinate with the efforts of the citywide comprehensive plan (Envision Cambridge) and the Climate Change Preparedness & Resilience Plan. • **Brookline, MA: The Urban Forest Climate Resiliency Master Plan:**[41] includes an assessment of the health and condition of the Town's Street trees and current urban forest canopy, a review of the Town's forestry budget and management practices, and a 10-year action plan outlining goals and recommendations to enhance the resiliency of Brookline's urban tree canopy. The Plan also addresses how Brookline can best serve the community, particularly Environmental Justice neighborhoods and vulnerable populations most susceptible to climate change impacts, such as the urban heat island effect.

[41] Urban Forest Climate Resiliency Master Plan | Brookline, MA - Official Website (brooklinema.gov)

Cooling Our Region

While there are many actions municipalities can take to address extreme heat, others will require and be strengthened by regional collaboration. Not all municipalities have the same resources and capacities to tackle climate resilience, and by working together we can leverage resources and expertise. This section outlines opportunities for joint advocacy, shared services, and regional procurement that are best suited for multi-municipal collaboration.

Strategy 1. Jointly advocate for State and Federal policy changes to protect residents and workers

The Metro Mayors Coalition and its Climate Taskforce play important roles in elevating critical regional issues and advocating for State and Federal policies and legislation. The MMC should continue to advocate for strong protections and policies from extreme heat. The following are select high priority and high-impact policy changes.

A. Advocate for an update the State Sanitation Code to include a maximum heat standard for renters similar to the minimum livable temperature standards already in place.
B. Advocate for an expansion of Utility Assistance Programs and the Low-Income Home Energy Assistance Program (LIHEAP) to cover summer cooling
C. Advocate for a suspension of utility shutoffs during summer months (June-August)
D. Work with partners to advocate for Occupational Heat and Safety Standards at the State level that exceed or supplement federal standards that are currently in process.
E. Work with the Department of Public Utilities (DPU) and utilities to better understand and prepare for the impacts of extreme heat on the electricity grid. Work to ensure that costs of grid upgrades and modernization are not passed on to LMI customers.
F. Advocate for a multi-agency Statewide Extreme Heat Working Group or similar Commission to coordinate extreme heat preparedness, response, and adaptation at the State level. Create a new Chief of Heat Resilience position at the State level.

Implementation: Scale	State
Implementation: Timeline	Near term
Implementation: Who leads/who partners	Metro Mayors Coalition and MMC Climate Taskforce MAPC National Consumer Law Center (NCLC), Conservation Law Foundation (CLF), MassCOSH
Equity Considerations	• Include LMI, BIPOC, and vulnerable communities at the table initially and in an ongoing manner.
Examples	• **California Code of Regulations (Title 8, Section 3395)** has Heat Illness Prevention Standards for outdoor workers as informed by OSHA

	• **Minnesota Occupational Safety and Health Administration** (MNOSHA) implemented a heat stress standard that is designed to protect employees against the risk of heat illness • **Oregon Occupational Safety and Health Administration (OROSHA)** adopted emergency Heat Illness Prevention rules in July 2021 that apply when temperatures in a work area reach or exceed 80F.[42]

Strategy 2. Work together to streamline and save resources on procurement, operations, and maintenance of critical cooling infrastructure.

Collective procurement and shared services can help municipalities save money and staff resources when purchasing, installing, operating, and maintaining new equipment. Group procurements can take advantage of economies of scale and receive lower/bulk pricing on certain equipment. Developing resources, including guides and templates, can reduce the burdens put on municipal staff, particularly for newer technologies.

A. Develop a shared procurement model for equipment including cooling equipment, shade structures, splash pads, water fountains/hydration stations, trees, maintenance equipment.
B. Develop a shared services model and contract for installation and O&M of critical cooling infrastructure (ideally tie into green jobs creation and advocacy).
C. Research and develop innovative funding and financing models for heat resilience projects, including public private partnerships
D. Work together to build regional market and demand for heat resilient materials such as reflective or low albedo building materials, green infrastructure equipment.

Implementation: Scale	Regional
Implementation: Timeline	Near term
Implementation: Who leads/who partners	MAPC Metro Mayors Climate Taskforce Municipal Finance and Procurement, Public Health, Planning and Community Development, Sustainability and Climate, Parks and Recreation
Equity Considerations	• Shared services and collective procurement can help reduce barriers and streamline processes for under-resourced municipalities. Municipal capacity varies within the region, and some municipalities need additional technical assistance and support.

• [42] (https://www.jdsupra.com/legalnews/oregon-osha-issues-temporary-heat-3545434/)

	• Service contracts and RFPs can include local hiring or minority-owned business considerations to ensure local job growth. and increased workforce diversity
Examples/Resources	• **Global Cool Cities Alliance** provides partnerships on cool roadways, along with best practices and guidance for cities.[43] • **MAPC supports shared services and municipal procurement** across a variety of technologies, lessons and models learned from these programs could be extended to a program around heat resilience and cooling infrastructure. • **In 2020, the North Suffolk Office of Resilience and Sustainability** was established to provide shared services between Chelsea, Winthrop, and Revere. They have a shared Resilience Manager and Sustainability Manager. The North Suffolk communities have a similar public health partnership.[44]

[43] Home - Global Cool Cities Alliance
[44] North Suffolk Office of Resilience and Sustainability | City of Chelsea MA

Emergency Response

Strategy 1. Develop municipal Heat Emergency Response Plans/Heat Action Plans and coordinate between municipalities where appropriate.

A municipal level Heat Emergency Response Plan or Heat Action Plan is a coordinated plan that describes and organizes activities to prevent heat-related morbidity and mortality and reduce infrastructure impacts. A Heat Response Plan may be a stand-alone plan or an appendix to an all-hazards plan depending on your municipality. The plan should guide departments and partners to provide services and information to the public and at-risk groups during periods of extreme heat. Plans should include how to mitigate, prepare for, plan, respond to, and recover from extreme heat related events. Plans should be updated regularly and include processes to evaluate and assess actions.

A. Establish municipal heat preparedness working group consisting of municipal staff, emergency managers, service providers, and community partners to develop and implement plans, procedures, and guidance.
B. Asses unique local conditions, heat thresholds, activation levels, capacities, resources, and vulnerable populations (elderly, infants and children, individuals with access and functional needs etc.). Identify specific actions to address needs of populations at greater risk of experiencing heat-related health impacts. Develop a list of partner agencies that work with and serve people with greater needs during a heat wave or accompany challenges like grid outages.
C. Delineate roles and responsibilities including how municipal efforts will be coordinated and communicate with other partners and stakeholders.
D. Host an Annual Regional Emergency Managers Roundtable through Metro Mayors Coalition and add extreme heat to MEMA regional meetings. Identify ways to further coordinate and collaborate among multiple neighboring municipalities to promote shared resources, mutual aid, and optimize efficiencies.
E. Identify municipal and regional opportunities for further training on extreme heat, climate, and public health within the emergency management field.

Implementation: Scale	Municipal, Regional, and State
Implementation: Timeline	Near term
Implementation: Who leads/who partners	Local Municipalities with representatives from various departments (Police, Fire, EMS, EMS, Public Health, Schools, DPW) MAPC can partner to help develop individual and joint plans and can assist in testing and evaluating plans
Equity Considerations	• Plans need to include consideration for vulnerable populations (older adults, infants and children, individuals with access and functional needs, those who are low income, language isolation, etc.).

Examples	Municipal plan can be an annex appendix to the local Comprehensive Emergency Plan. • **Somerville, MA Hazard Mitigation Plan** is updated once every five years. The most recent update of the Plan was approved by the City Council in January 2022. It is the first-time climate change is front and center and woven into each component of Somerville's Hazard Mitigation Plan. The Plan will help guide efforts to respond and adapt to the impacts of climate change to create a more resilient community. Building on years of science-based research and public engagement, the Plan more accurately reflects the changing frequency, intensity, and severity of natural hazards facing Somerville as a result of climate change. The Federal Emergency Management Agency said the Plan could be referenced as a best practice for region 1.-2021 • **District of Columbia Heat Emergency Plan** https://hsema.dc.gov/sites/default/files/dc/sites/hsema/page_content/District%20Heat%20Emergency%20Plan%20July%2004%202021.pdf • **Maryland Department of Health Extreme Heat Emergency Plan** https://health.maryland.gov/preparedness/Documents/MDH%20Extreme%20Heat%20Emergency%20Plan%202020.pdf https://www.epa.gov/heatislands/excessive-heat-events-guidebook (2016)

Strategy 2. Operate cooling centers during extreme heat events, following best practices to promote use and accessibility.

Designated cooling centers are an underutilized and unevaluated response to extreme heat. Many municipalities open temporary cooling centers when a heat emergency is declared or designate a public building like the library or senior center as a cooling center. However, research shows that cooling centers are underutilized, to the point that some municipalities have stopped using this as a strategy. The following are some best practices and considerations to utilize when planning cooling center strategies and seeking to improve access and use of these spaces. See also Cool Communities Strategy 2 for Resilience Hubs.

A. Identify sites that are already well utilized by the community, such as senior centers, libraries, schools, and recreational facilities, for use as cooling centers and advertise their status as cooling centers throughout the summer season, with strategic and inclusive branding. Consider extended center hours into the evening and make a plan for staffing if a heat emergency occurs at a time when these locations may be understaffed or typically closed.
B. Ensure sites used as cooling centers are energy resilient by prioritizing these sites for microgrid development, renewable energy, and energy efficiency upgrades, and/or equipping sites with back-up energy storage or, if needed, generators.

C. Provide programming at cooling centers, including arts and recreational activities, and provide amenities and services that help attract users and facilitate their access to resilience promoting resources (e.g., free WiFi, charging outlets, staffing service navigation help desks, and distribution of food, water, and cooling kits, etc.).
D. Remove cooling center barriers by providing transportation to cooling centers, siting cooling centers along transit- and pedestrian-accessible locations and making pet accommodations.
E. Collect data on cooling center usage and user experience to facilitate opportunities to make improvements to cooling center operations and communications over time.

Implementation: Scale	Municipal and Regional
Implementation: Timeline	Near to medium term
Implementation: Who leads/who partners	Municipal Public Health, Emergency Management/Community Safety, Department of Public Works, Library, School Department, Senior Services, and Family Services Departments MAPC
Equity Considerations	• Consider access to cooling centers including time of operation, transit, language access, and ADA compliance of spaces.
Examples	• **Boston Center for Youth and Families** operates cooling centers when a heat emergency is declared[45].

[45] Mayor Declares Heat Emergency in Boston, Opens 15 BCYF Cooling Centers | Boston.gov

Section 4. Monitoring, Assessment and Evaluation

Resilience to climate-driven heat is an emerging and growing field both in research and practice. Regular and consistent monitoring, assessment, and evaluation will be necessary to continue to learn from and adapt the plan and projects as they are implemented. Implementation of the strategies and actions contained within the plan will require time, effort, and funding. The plan proposes a 5 to 7-year implementation timeline, with progress on priority strategies in the first 1 to 2-years. Monitoring and evaluating these implementation efforts will help foster accountability with plan stakeholders and create opportunities for ongoing learning and adaptation as strategies move forward. Evaluation is also important to achieving equitable outcomes by helping us understand who is being most impacted by the plan's actions.

In collaboration with the MMC Climate Taskforce and Heat Preparedness Working Group, MAPC will implement the following monitoring, assessment, and evaluation activities:

Plan Implementation Checklist & Climate Taskforce Workshop (annually)

Each year, MAPC will disseminate an implementation checklist to Climate Taskforce municipal representatives and cover the topic during at least one regularly scheduled quarterly meeting. The checklist will serve as a tool for municipal representatives to capture progress on plan strategies and actions within their individual municipality, as well as brief reflections on their experience advancing this work. MAPC will collect and summarize checklist responses and conduct a working session with Climate Taskforce members during a regularly scheduled meeting to collectively review and reflect on the checklist findings. The session will also be a space to reflect on progress on regional actions, exchange lessons learned, troubleshoot common challenges, and develop new funding proposals.

To report on progress to the public, MAPC will seek to produce a 1 to 2-page summary infographic to be shared on the Climate Taskforce web page and publish a related blog post at least once a year. MAPC will also support Climate Taskforce members in sharing plan implementation successes with local media.

Plan Update (5-year intervals)

The Metro Mayors Climate Taskforce will aim to update the plan every five years, assuming that funding is available. The plan update will begin with a comprehensive assessment of progress on implementation of the previous plan’s strategies and actions. The plan update will also involve updating the land surface temperature index and social vulnerability index every five years to ensure the most up-to-date methods and data inform future action. New strategies, actions, and priorities are likely to emerge as this field progresses and we better understand the evolving extent of climate change’s impact on extreme heat in Metro Boston.

Additionally, the current plan does not address cascading or compounding impacts of extreme heat with other climate hazards (such as flooding), or the full range of impacts of an extreme

heat event on lifeline infrastructure systems (such as the electricity grid, transportation network, and food systems). With recent experiences of “heat domes” in other parts of the country where elevated temperatures far exceeded the normal range, a future iteration of the plan may include additional research and strategies for municipalities to better prepare for this type of extreme heat event.

Data and Research Needs

The planning process surfaced data and research needs, which represent obstacles to a more thorough monitoring and evaluation approach. Data gaps include:

- Representative and high-quality data on ambient air temperatures and indoor temperatures, especially data on temperatures experienced by people in their homes and in neighborhoods most likely to be impacted by rising temperatures.
- Public health surveillance data on heat-related health impacts that could help planners and health practitioners better understand the public health toll of climate-driven heat and target interventions to address these health impacts. Surveillance data include emergency room visits, ambulance runs, and hospitalizations during high heat days, and instances of heat-related illnesses. While data will be anonymized, ideally would also include factors such as race, ethnicity, age, gender, income to better understand which populations are seeing what health impacts.
- Data on workplace heat exposures and impacts by different industries and sectors.
- Data on access to and usage of cooling amenities and infrastructure, including residential cooling access and affordability and access to cooling infrastructure in public facilities, such as schools.
- Data on behavior changes and adaptation measures, including preferred cooling locations and effect on mode choice and travel frequency.
- Behavioral insights research to help practitioners better understand the effectiveness and reach of different heat health messages and communications tactics.
- Monitoring the hyper-local temperature impacts of greening/cooling projects before, during, and after implementation.

The Taskforce will continue to partner with academic institutions on research to address data gaps and will look to pursue funding to support data collection and analysis efforts. Plan partners will be encouraged and supported in conducting air temperature monitoring when deploying projects in alignment with this plan. Consistent with Cool Communities Strategy 3, we will also work to engage health providers in heat adaptation efforts with the possible outcome of identifying data collection and sharing practices to better understand the impact on public health.

Section 5. Implementation and Next Steps

The MMC Climate Taskforce meets quarterly to advance regional priorities and share best practices. During the past 1.5 years developing this plan, a Heat Preparedness Committee was developed with municipal representatives from planning, sustainability, and public health representatives. Ten community-based organizations/non-profits also received funding to participate in the planning process. As we move from planning to implementation there will be two tiers of work:

1. **Individual Municipalities:** Each of the fifteen municipalities will work to determine what local priorities and municipal actions they can advance in the near-term, whether through public health, planning, or other departments. Municipalities will be encouraged to work together, when possible, to implement new policies, programs, or processes.
2. **Regional Collaboration:** Other strategies and actions will be advanced and implemented through the Climate Taskforce and regional collaboration, with technical support from MAPC.

Alignment with Climate Mitigation and Equity Goals

While urban heat has received significant attention both in this plan and beyond, addressing this is only part of the challenge we face. As our region gets hotter due to climate change, urban heat mitigation must also be paired with efforts to rapidly reduce GHG emissions. Successful GHG emissions reduction efforts could mean the difference between experiencing an average of 20 days over 90 to over 40 by 2030. To that end, we should consider and prioritize strategies and actions that have co-benefits of reduced GHG emissions to align with our regional climate goals. We must also prioritize strategies and actions that advance racial justice and social equity to ensure that those most vulnerable to extreme heat are prioritized in the development and implementation of solutions.

Heat Preparedness Working Group

Establish an ongoing "Heat Preparedness Working Group" based on the above-referenced Heat Preparedness Committee to be housed in the MMC Climate Taskforce. This subgroup will be comprised of municipal representatives, emergency managers, state agencies, and non-profit members. The group will meet regularly to advance the goals of the plan and report back to the MMC Climate Taskforce and the Metro Mayors Coalition's mayors and managers. Funding to support participation of community-based and frontline organizations will be identified.

Annual Heat Resilience Summit

The MMC Climate Taskforce will also host a yearly Heat Resilience Summit to bring together diverse stakeholders and leaders from across the 15 municipalities to share best practices, troubleshoot challenges, and raise awareness about extreme heat. The Summit will be an opportunity to engage Plan stakeholders outside of the Climate Taskforce and Heat Preparedness Workgroup, including community-based organizations, social service agencies, health and emergency preparedness practitioners, and other municipal staff. The Summit will

follow the Climate Taskforce checklist and workshop activity, so that information generated through that activity can be shared with Summit participants.

Identify Funding Sources

The Heat Prep Working Group will work with MAPC to identify additional funding sources for priority projects including State and Federal grants, private foundation funding, and other opportunities to fund this work over the next 2-5 years.

Toolkits and Technical Assistance

MAPC will continue to develop and disseminate toolkits and provide technical assistance for municipalities to do work individually as well as collaboratively. Additional webinars, workshops, and opportunities to share best practices will be developed through the Taskforce and Working Group based on needs and interests of the municipalities.

Appendix

Link to condensed strategies and actions: Heat Prep Plan Appendix A. .xlsx