



EVERETT

SOMERVILLE

CHARLESTOWN

28

CAMBRIDGE

WATERTOWN

DOWNTOWN

East Boston Memorial Park

ALLSTON/
BRIGHTON

CHINATOWN

90

20

Packard's
Corner

90

Brighton

Tufts Med

NEWTON

FENWAY/
KENMORE

SOUTH END

SOUTH BOSTON

BROOKLINE

Brigham
Circle

Ruggles

Mass
Ave

Roxbury
Crossing

Nubian Sq

Newmarket

Joe Moakley
Park

9

Jackson
Sq

ROXBURY

JFK/UMass

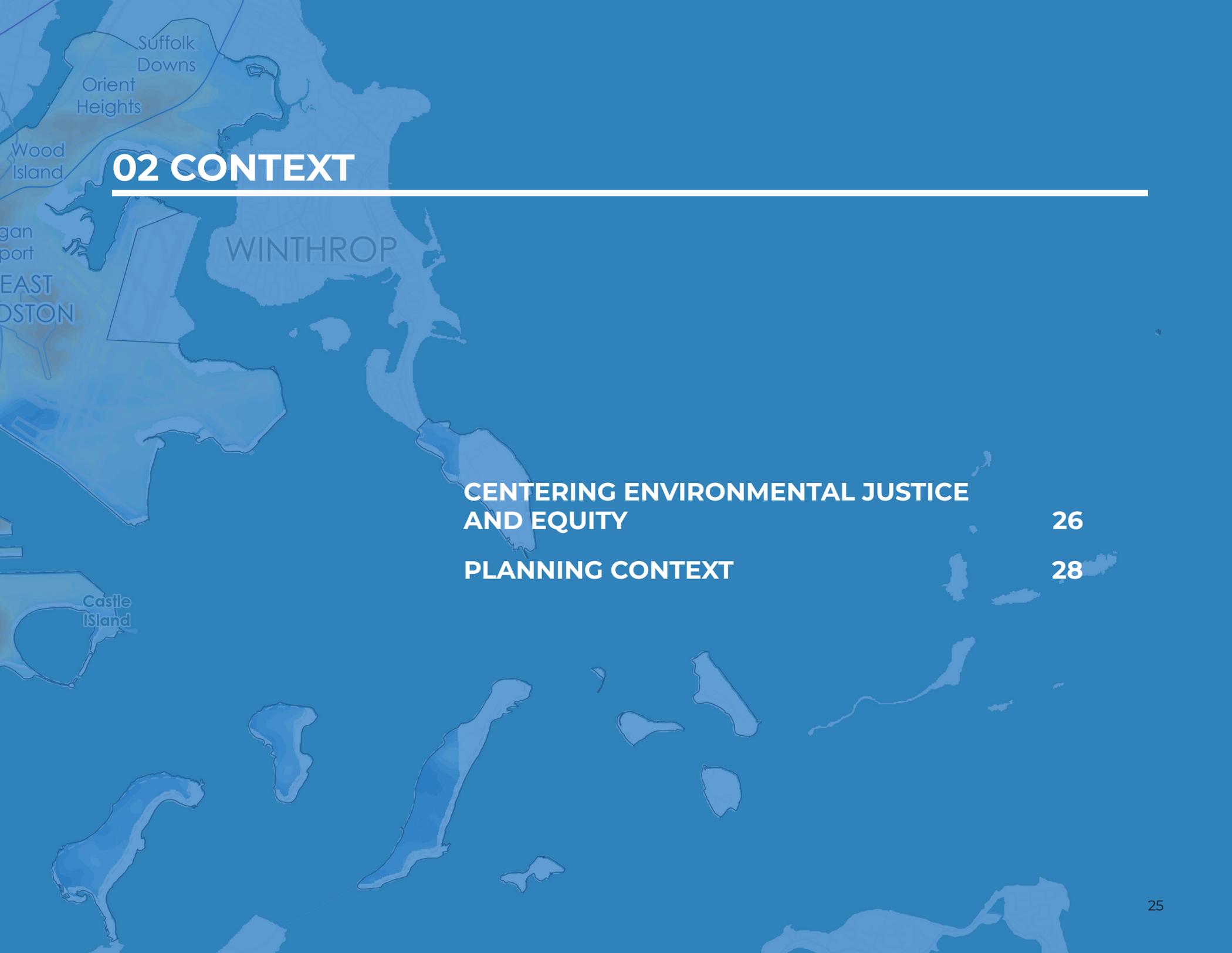
Jamaica
Pond

Uphams
Corner

Savin Hill

JAMAICA
PLAIN

Four Corners/
Geneva



02 CONTEXT

**CENTERING ENVIRONMENTAL JUSTICE
AND EQUITY**

26

PLANNING CONTEXT

28

CENTERING ENVIRONMENTAL JUSTICE AND EQUITY

CENTERING ENVIRONMENTAL JUSTICE AND EQUITY IN HEAT RESILIENCE

Climate change poses a greater threat to some Bostonians. Seniors and young children, people with limited English proficiency, and those with low incomes, medical illnesses, or disabilities are all at elevated risk.¹ Centering environmental justice and equity throughout planning processes can ensure that strategies and outcomes meet the needs of Bostonians who may be disproportionately affected by extreme heat impacts.

To accomplish this, it was critical that the project be informed by history and grounded in environmental justice and an equity-centered approach. The project team and Steering Committee participated in a facilitated training on systemic racism, racial equity, and historic development patterns in Boston to set a foundation for the planning process. The project team explored how Boston's history has informed existing conditions and discussed how unconscious biases can impact planning and implementation. The project team aimed to build a shared understanding of institutional culture and Boston's social and historical context to guide an intentional and effective process to produce effective resilience measures.

Systemic inequities and racism have left lasting impacts in Boston's hottest neighborhoods.

Elements of the built environment affect exposure to heat and the ability to access cooling, and can also contribute to greater sensitivity to heat risk. Trees and other nature-based cooling features, building materials, and the overall design of the built environment can affect both the local air temperature and the quality of the air. Factors including the distribution of trees, accessible green space, and the amount of hardscape across neighborhoods today are results of past planning decisions.

Thoughtful acknowledgement of how Boston's historical context has informed today's built environment and current experiences is critical to addressing the root causes of heat risk and vulnerability. Histories of racism and inequitable investment across neighborhoods in Boston have played a role in shaping the experiences of communities who experience disproportionate impacts of climate risk today. This includes environmental justice communities such as communities of color, lower-income communities, and immigrant communities, all of whom may also face compounding social, economic, and public health stressors. As a result, high summer temperatures can be more dangerous for environmental justice

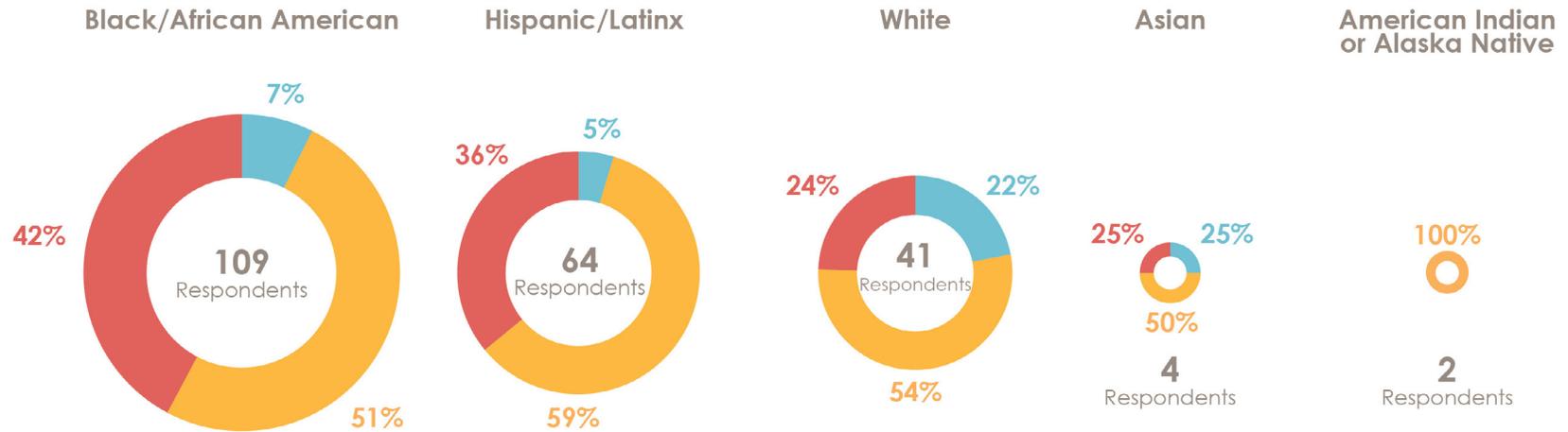
communities who live and work in temperature hot spots. In preparing residents and communities for extreme heat, Boston must do so in a way that addresses systemic inequities in exposure to heat, access to cooling, and sensitivity to heat risk.

A people-centered and equity-focused approach to heat resilience advances multi benefit strategies.

The *Heat Plan* helps advance a just and equitable plan to reduce extreme heat impacts. The plan identified five neighborhood focus areas to assess neighborhood-level extreme heat factors and impacts including Chinatown, Dorchester, East Boston, Mattapan, and Roxbury. These neighborhoods have some of the highest extreme temperatures across the city that overlap with where environmental justice populations live and work. By focusing the planning process and strategy development with environmental justice communities, we can develop co-beneficial resilience strategies that will help us build a more equitable city.

When it is very hot outside, how often do you feel too hot at home?

Always Sometimes Never



The citywide online survey showed that the majority of respondents feel too hot in their home.

However, the burden of heat exposure at home falls disproportionately on Black and Latinx communities. Of Black respondents, 42% always feel hot in their home (represented by the red segment in the graph), while the percentage of white respondents that always feel hot is just over half of that. While

5% of Latinx respondents never feel hot in their home (represented by blue in the graph above), the percentage of white respondents that never feel hot in their home is about four times higher.

Although the survey was not a statistically representative sample of the City of Boston, it still illustrates the disproportionate exposure of heat experienced by people of color in their own homes.

PLANNING CONTEXT

The Heat Plan identifies strategies to address the impacts of extreme heat events. The heat resilience strategies presented in the plan range from near-term actions to provide immediate cooling to long-term strategies to decrease localized ambient temperatures. The Heat Plan builds on and complements many recent and ongoing planning climate preparedness efforts. Collectively, the plans, policies, and programs detailed below have provided a foundation for building heat resilience in Boston.

PLANS, POLICIES, AND PROGRAMS

CLIMATE READY BOSTON

Climate Ready Boston is the City's initiative to prepare Boston for the near- and long-term impacts of climate change. The 2016 *Climate Ready Boston* report presented an assessment of Boston's vulnerabilities to climate impacts and proposed initiatives to build resilience across neighborhoods, infrastructure, buildings, and residents. Climate Ready Boston was a major step in integrating climate preparedness into all aspects of city planning, review, and regulation and included the following:

- » Updated climate projections
- » Comprehensive evaluation of current and potential future risks through a vulnerability assessment study
- » Eight focus areas with spatially concentrated flood risk, including Charlestown, Charles River, Dorchester, Downtown, East Boston, Roxbury, South Boston, and South End
- » Climate Resilience Initiatives including policy, planning, programmatic, and financial initiatives to address the identified risks

Since 2016, the City of Boston has conducted coastal resilience planning in neighborhoods along Boston's coastline. The City will continue long-term resilience and adaptation planning to address extreme urban heat through this study.

IMAGINE BOSTON 2030

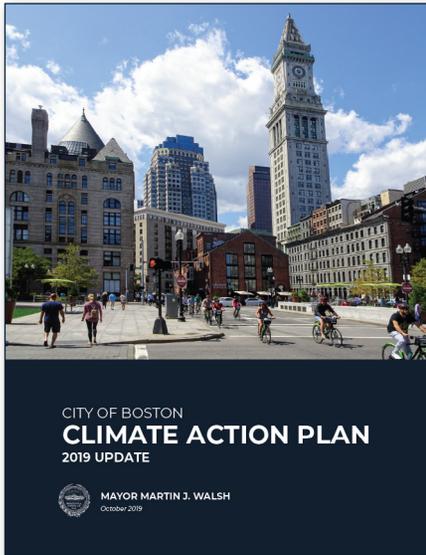
The City's first comprehensive plan in 50 years, *Imagine Boston 2030*, sets a long-term vision for the City and outlines goals towards economic growth, increased affordability and equity, and climate change preparedness for 2030. This plan highlights some cross-cutting challenges and opportunities related to climate change, as the City assesses future policy, zoning, and other requirements in response to Boston's changing needs. Strategies detailed in the report include steps towards improving environmental quality and resiliency of waterfront areas, enhancing energy efficiency and security, as well as preparing Boston's built infrastructure and its residents for the impacts of climate change.

2019 CLIMATE ACTION PLAN UPDATE

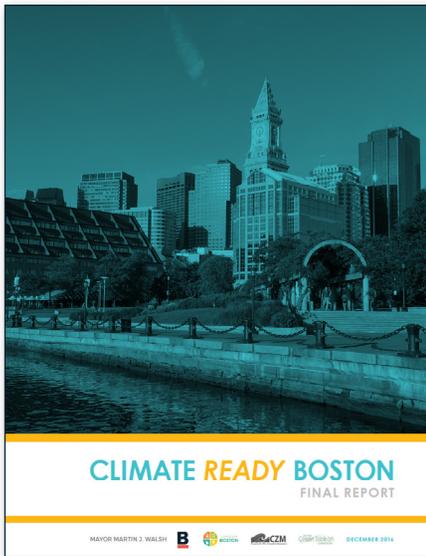
Future temperatures in Boston will depend on how much global greenhouse gas emissions are reduced. The 2019 *Climate Action Plan Update* is Boston's roadmap to reach citywide carbon neutrality goals. The plan includes action steps to achieve zero net energy and zero net carbon buildings through deep energy retrofits and electrification, emphasizing equity and stakeholder engagement. The 2019 update builds on the *Boston 2014 Climate Action Plan Update*.²

RESILIENT BOSTON

Released in 2017, *Resilient Boston* outlines strategies within four long-term vision areas crafted to build



2019 Boston Climate Action Plan



2016 Climate Ready Boston

the overall resilience of Boston, with particular consideration given to addressing its history of racism, segregation, and racial inequities. *Resilient Boston* was developed as part of the City's participation in the Rockefeller Foundation's 100 Resilient Cities initiative.

HEALTHY PLACES: PLANNING FOR HEAT, TREES, AND OPEN SPACE

The Healthy Places Initiative is a coordinated planning effort across several City plans: the *Heat Resilience Solutions for Boston*, the *Urban Forest Plan*, the *Parcel Priority Plan*, and the *Open Space and Recreation Plan*. Together, these plans expand the urban tree canopy, improve the parks system, and help Bostonians thrive in a changing climate.

The *Urban Forest Plan* (UFP) will help the City deliver a thriving, collaboratively sustained urban forest. The UFP builds on the 2014-2019 Boston Parks Urban Canopy Change assessment. The goal is to create a strategic plan that is based on science and defined by the needs and desires of the community, to ensure Boston's urban forest will be better managed both today and 20 years from now.

The *City of Boston Open Space and Recreation Plan 2022-2028* will present the process, analysis, plan goals, and objectives for improving and protecting open space in Boston.

The *Parcel Priority Plan* is a long-term visioning plan to prioritize parcels of land to acquire and protect for public use.

GREATER BOSTON AREA RESEARCH GROUP (GBRAG)

In 2016, the City of Boston and the Green Ribbon Commission convened the Boston Research Advisory Group (BRAG), now named the Greater Boston Research Advisory Group (GBRAG), to better understand local climate change impacts and develop the Climate Projection Consensus. Both BRAG and GBRAG were funded and supported by the Barr Foundation. The Climate Projection Consensus summarized four factors of climate change, including extreme temperature, sea level rise, extreme precipitation, and coastal storms. These factors drive major climate hazards in Boston, including coastal and riverine flooding, stormwater flooding, and extreme heat.

GBRAG is completing an update to the first Climate Projection Consensus, which will provide updated projections of the climate hazards facing Boston. The temperature projections included in this report include the updated projections produced by GBRAG.

CLIMATE RESILIENT DESIGN STANDARDS AND GUIDELINES FOR PROTECTION OF PUBLIC RIGHTS-OF-WAY

In 2018, the City of Boston completed design standards for engineers and designers to use when designing flood-resilient infrastructure. These guidelines include design adjustments for extreme heat and were created to address concerns related to health and safety impacts, thermal expansion, material degradation from excessive heat, pavement softening, and impacts on electrical or mechanical systems.³ The design guidelines also call for the consideration of low maintenance plants that reduce urban heat when designing flood protection infrastructure.

DEVELOPMENT REVIEW

Large new development projects (over 50,000 square feet), small projects (over 20,000 square feet), planned development areas, and institutional master plans are subject to development review by the Mayor's Office of Planning/Boston Planning and Development Agency (BPDA). Two specific zoning articles relate to development characteristics that can influence heat conditions on and around development sites. Article 80 review includes evaluation of a proposed project's impact on the public realm and the environment. Both of these areas can result in impacts that contribute to increased localized temperatures.

Article 37 includes a checklist review of a proposed development's green building qualities.

PUBLIC HEALTH AND EMERGENCY MANAGEMENT

Several existing plans specifically address the City's operational approach to extreme heat events. Extreme Temperature Annexes, developed by BPHC and OEM, outline operational procedures for deploying information, services, and assistance during periods of extreme heat emergencies.

In 2021, the update of the City's Natural Hazard Mitigation Plan (NHMP) was completed through OEM and adopted by the City Council. The Federal Emergency Management Agency (FEMA) requires the City to update its Natural Hazard Mitigation Plan every five years to remain eligible for funding used to put in place the strategies identified in the plan. The NHMP provides a comprehensive plan to reduce or eliminate current vulnerability and damages associated with climate-related hazards in addition to a range of other natural disaster types. Together, the NHMP and Climate Ready Boston are coordinated to ensure Boston is prepared for and can recover from natural disasters.

ONGOING NEIGHBORHOOD DEVELOPMENT PLANS

Near-term implementation and the long-term success of heat resilience strategies following the plan will depend on coordination with ongoing

neighborhood development plans, especially in the *Heat Plan's* focus neighborhoods. This plan aims to be an asset for further coordination with the following development plans:

- » PLAN: East Boston
- » PLAN: Newmarket
- » PLAN: Mattapan
- » PLAN: Downtown
- » PLAN: Charlestown

COASTAL RESILIENCE PLANNING

In addition to the impacts of extreme heat, Boston also faces increasing risk of flooding resulting from sea-level rise and coastal storms. As a coastal city, identifying flood projection solutions for Boston's shoreline has been a major priority. Since the release of the 2016 *Climate Ready Boston* report, the City has completed neighborhood-level coastal resilience planning along Boston's coastal neighborhoods. These studies include East Boston and Charlestown Phase I in 2017, South Boston in 2018, and North End/Downtown and Dorchester in 2020. The primary goal of these neighborhood coastal resilience plans was to take a closer look at the localized impacts and specific strategies that could be undertaken to mitigate coastal flood risk.

In fall 2020, the City of Boston's Environment Department, through Climate Ready Boston, launched Coastal Resilience Solutions for East Boston

and Charlestown (Phase II) to assess sections of each neighborhood that were not assessed during the 2017 Phase I study. The study evaluates coastal flood risk in the neighborhoods and identifies flood protection strategies that effectively reduce this flood risk, while creating additional benefits for the community and improving overall quality of life. After the completion of Phase II, the City will have developed coastal resilience solutions for all of Boston's coastal neighborhoods.

REGIONAL CONTEXT OF RESILIENCE AND HEAT PREPAREDNESS

The *Heat Plan* coordinated with three ongoing regional heat vulnerability analysis and preparedness planning efforts in Greater Boston:

- » Wicked Hot Mystic through the Museum of Science, the Mystic River Watershed Association (MyRWA), and the City of Cambridge
- » C-HEAT through Boston University (BU), GreenRoots, and the City of Chelsea
- » Regional heat preparedness planning through the Metropolitan Area Planning Council (MAPC)

The project team convened with these teams to share data, collaborate on community outreach materials, and coordinate project tasks. This collaboration helped to ensure the *Heat Plan* builds on and complements previous and parallel efforts.

A key difference of the *Heat Plan* is that the analysis included air temperature modeling, whereas other projects included temperature maps developed from satellite data or from temperature sensors. During the modeling process, the project team compared the model outputs to other independent data sources, including MAPC's land surface temperature derived from satellite data. The existing data sets provided helpful comparison points to review patterns that emerged from the *Heat Plan*'s citywide heat analysis.

Jul 20

Investigating: **Extreme Heat**



📍 Cambridge, MA, US

89°F

Thankful my bus stop is in the shade of the building. It's not even noon yet and the heat feels oppressive... I'm keeping my water bottle close today! Sirens and ambulances all over my neighborhood. Stay safe out there everyone and check in on each other!

Wicked Hot Boston's Citizen Science Platform: Wicked Hot Boston studied extreme heat through community-based participatory science. Source: Museum of Science