UNIVERSITY OF TORONTO | SCHOOL OF CITIES

BU Initiative on Cities

Climate Risks and Climate Displacement in Boston

Governance, policies, and challenges

CIDRARC

Climate-induced displacement, resettlement, adaptation, and resilience for cities

CIDRARC is the Global Research Network on Climate-Induced Displacement, Resettlement, Adaptation, and Resilience for Cities, a research partnership, hosted by the School of Cities, that connects a team of international social and physical scientists and practitioners to refine our understanding of human decisions about adaptation and migration, as well as the adaptive capacities of different groups and infrastructures across contexts. The goal of CIDRARC is to build greater understanding of how climate displacement plays out in different contexts based on the interplay of individual and institutional perceptions and management of risk. Our objectives are thus:

- to identify how local embodied knowledge in urban regions informs climate adaptation through the lens of displacement in different contexts;
- to develop new measures of climate migration;
- to build communities of practice and tools to help different types of cities, from core to periphery, cope with climate displacement and its related inequities and vulnerabilities.

CIDRARC emerged in 2023 out of two workshops funded by a SSHRC Connections Grant and led by the University of Toronto's School of Cities and Boston University's Initiative on Cities. In Spring 2024, SSHRC awarded CIDRARC a Partnership Development Grant, which supported research including eight case studies (Barcelona, Boston, Cape Town, Costa Rica, Karachi, Kelowna, Melbourne, Tacloban City).

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BCNUEJ Barcelona Laboratory for Urban Environmental Justice and Sustainability

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Introduction

Boston, an historic coastal city with 47 miles of shoreline, is particularly vulnerable to the impacts of climate change. Its climate is increasingly resembling that of the mid-Atlantic, with milder, drier winters and increasingly hot summers, punctuated by more frequent and intense rainfall. The city's most pressing climate-related threats are rising sea levels, extreme precipitation, and intensifying heat waves. In response to these interrelated threats, Boston has spent the last decade laying the groundwork for climate adaptation and mitigation, and is now focused on the critical next phase: implementation.

This case study summarizes the principal climate change-driven threats facing the city of Boston today and the planning interventions designed to manage them. It then discusses how these climate threats culminate in displacement pressures in and around the Boston metropolitan area and Massachusetts more generally. After an overview of governance structures and policies on migration and related pressures on Boston's housing systems, a final section offers implications for policy.

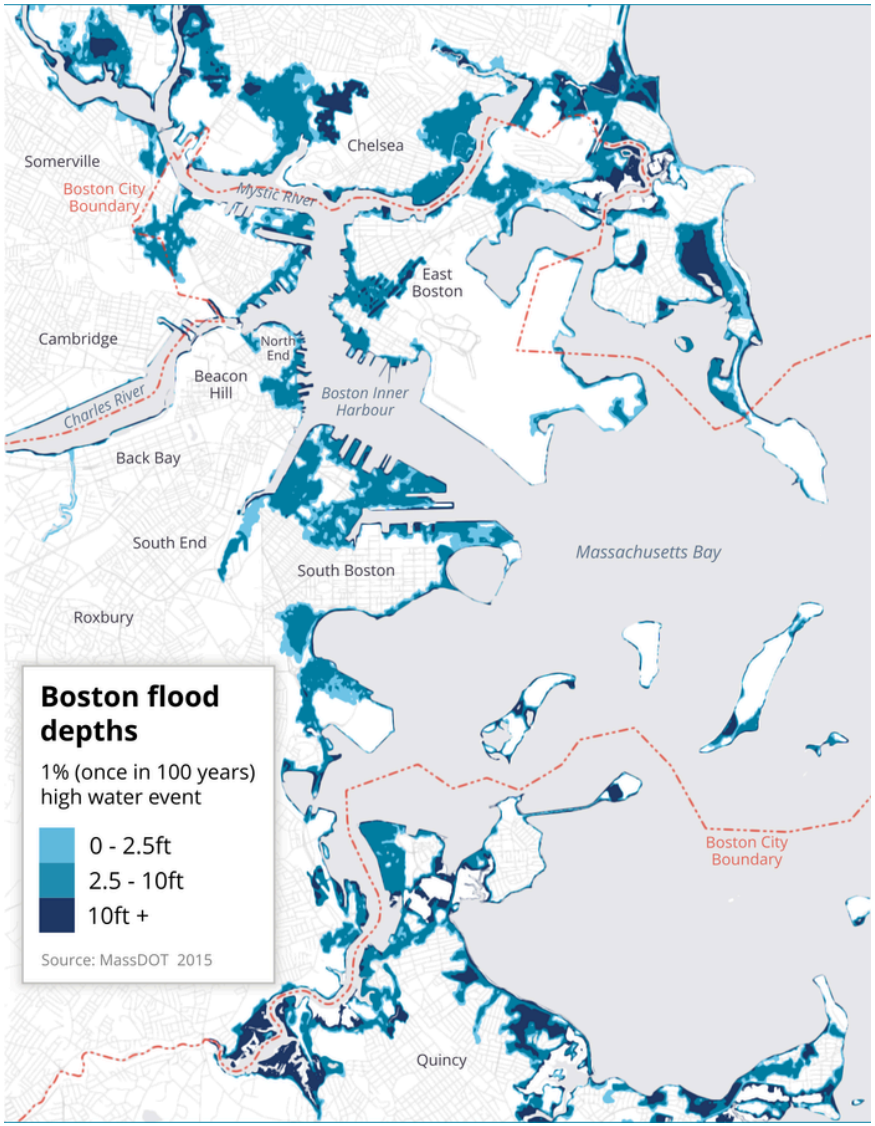
Boston's climate risks and planning interventions

Currently, Boston faces three key climate risks, each of which presents unique challenges and requires its own adaptations: sea level rise, stormwater flooding, and extreme heat.

Sea level rise and flooding

Projections indicate that sea levels along the Boston coastline could rise four to seven feet by the end of this century. Areas like East Boston, South Boston, and the Seaport District are already experiencing regular flooding, with Boston Harbor flooding parts of the Seaport about a dozen times annually. The City's 2016 Climate Ready Boston initiative focuses on both short- and long-term solutions to coastal flooding. It includes neighbourhood-specific resilience plans that involve constructing greenways, berms, and floodwalls to act as natural barriers. The initiative emphasizes the importance of fortifying older, low-lying buildings, particularly those housing vulnerable populations.

Figure 1: A projection adapted from the Massachusetts Department of Transportation shows the extent and depth of flooding in a 1% (once in 100 years) high water event in Boston.



Boston has also created one of the nation's first Coastal Flood Resilience Overlay Districts, integrating flood risks into zoning regulations for new construction and building retrofits. This ensures that new developments meet stricter flood protection standards. Despite these ambitious goals, the City has been criticized for overreliance on the private sector for implementing many of these resilience strategies. This in the context of the City only owning about 16 percent of the coastline – the state owns close to 50 percent and about 30 percent is private.

Precipitation and stormwater flooding

The frequency of extreme precipitation events has increased over recent decades, leading to more frequent stormwater flooding. Future projections suggest precipitation intensity could increase by up to 30 percent by 2100. Due to its aging stormwater infrastructure, as well as the fact that one-sixth of the city sits on landfill, Boston is expanding its green infrastructure network, which includes porous pavement, rain gardens, and constructed wetlands that help absorb excess stormwater. To fund this work, Boston's Water and Sewer Commission (BWSC) recently implemented a new Stormwater Charge for properties with significant impervious surfaces. Customers can also receive grants to reduce stormwater runoff. The City's planning prioritizes upgrades to stormwater systems in vulnerable areas like the South End and Roxbury, which experience frequent flooding due to poor drainage.

Extreme heat

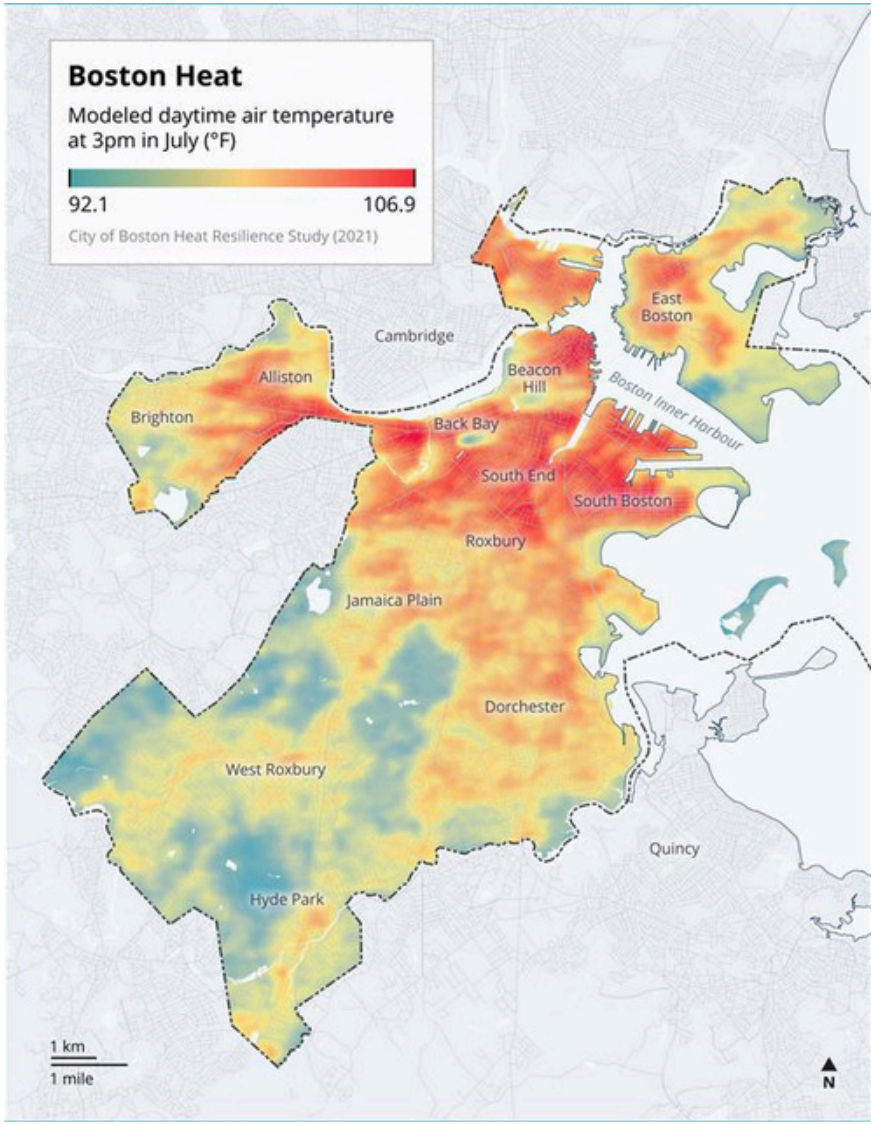
Boston is also experiencing longer, more intense heat waves. By the 2070s, Boston could see six- to seven-fold increases in 90-degree Fahrenheit days, which have already accelerated in the last decade. In response, the City has incorporated heat resilience into its broader climate adaptation strategies, with a particular focus on vulnerable neighbourhoods that suffer from the urban heat island effect. Efforts include expanding the city's urban tree canopy and greenspaces to provide cooling, especially in historically underserved areas.

Boston is also improving access to air conditioning in low-income communities.

Multiple threats

The City's resilience planning goes beyond addressing individual climate risks – it promotes solutions that deliver co-benefits. For example, green infrastructure that manages stormwater also provides cooling, while improvements in housing resilience simultaneously reduce displacement risks from both flooding and heat. The City's forward-thinking approach, particularly through the Office of Climate Resilience, ensures coordination across departments to deliver integrated, long-term solutions.

Figure 2: A map adapted from the City of Boston's interactive Urban Heat Explorer illustrates the distribution of extreme heat stress throughout the City in 2024.



Programs like Heat Resilience Solutions for Boston aim to address the health risks associated with extreme heat, especially for elderly residents and those living in housing without proper insulation or cooling systems.

Environmental justice (EJ) communities designation

Recognizing that an outsized share of the burdens of climate change may fall on already disadvantaged communities, Boston has designated environmental justice (EJ) communities. At the municipal level, Climate Ready Boston has identified neighbourhoods like East Boston as priorities for enhanced flood protections, and these efforts are part of a larger push to rectify historical disinvestment and ensure that climate action fosters equity and resilience. While the City is working to stabilize housing for current residents – ensuring that low-income populations already facing displacement are not pushed out due to rising costs – it will also need to plan for climate migration, as displaced residents from other regions may seek refuge in the city, further straining housing markets. The State of Massachusetts has prioritized EJ communities in their 2022 Massachusetts Climate Change Assessment and in 2024 they released the state's first-ever Environmental Justice (EJ) Strategy.

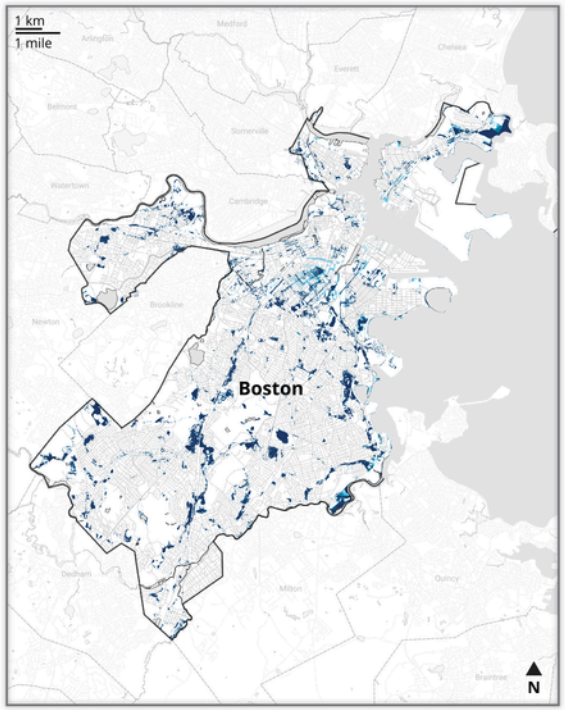
Climate displacement

As climate migration becomes an increasingly pressing issue, some cities in Massachusetts are grappling with their role as 'sending' cities, while others are preparing for growth as prospective 'receiving' cities for climate migrants. The planning interventions underway to alleviate flooding and heat pressures may exacerbate local displacement.

Due to the dearth of data and projections, it is difficult to fully grasp the extent of present and potential future impacts of displacement in Boston and Massachusetts. For Boston, the challenge may be twofold: managing the potential for displacement from within, while also possibly serving as a sanctuary for those displaced from other regions or countries. In addition, as Boston seeks to reduce displacement of its residents with climate mitigation and adaptation strategies, it also risks triggering displacement through the process of 'green gentrification,' creating the risk of 'double displacements.'

While Boston is leading the country on climate resilience, it has not yet applied a 'climate displacement' framework to plan for significant movement of residents into or out of the city. Instead the City is focusing on keeping people in-place through fortification from sea level rise (SLR) with coastal resiliency infrastructure, urban cooling to improve

Figure 3: A series of maps adapted from Boston's 2022 Heat Resilience Plan illustrate the interlinkages between heat and flooding resiliency policy and infrastructure.

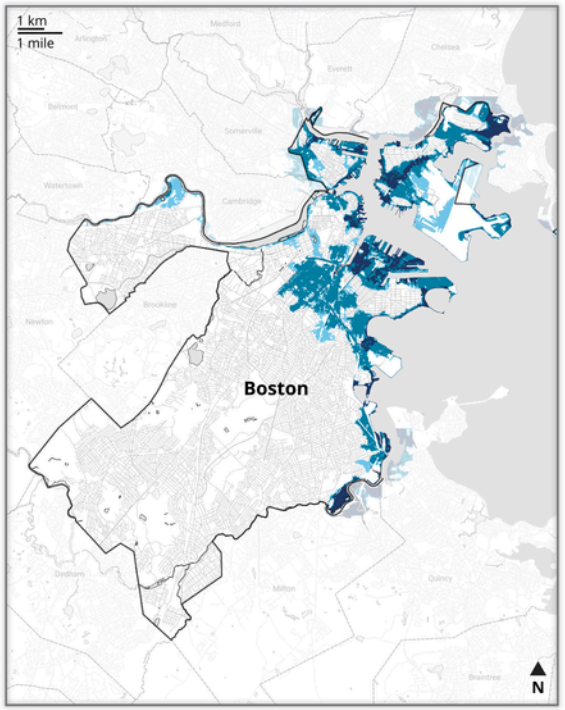


Stormwater flooding
36" SLR - 2070s or Later

- Near-term (2030s-2050s)
- Medium-term (2050s-2070s)
- Long-term (2070s onwards)

Green infrastructure to reduce stormwater flooding could also reduce temperatures.

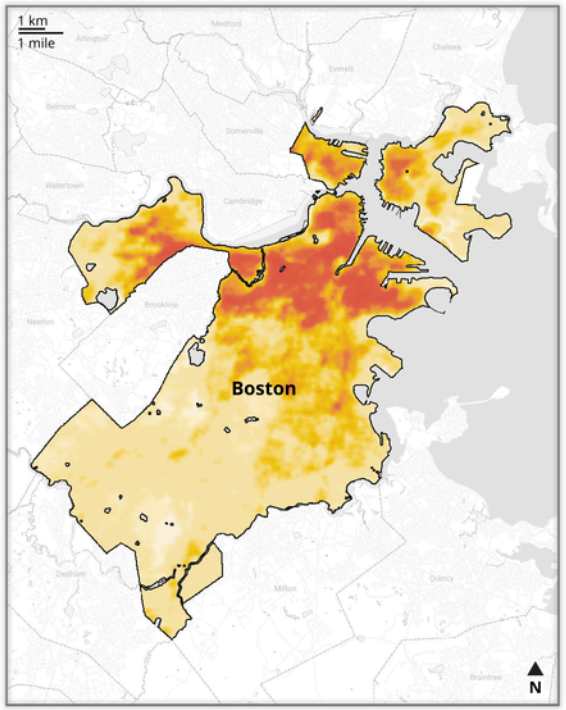
Source: City of Boston 2022 Heat Resilience Plan



Flood progression map
36" SLR - 2070s or Later

- Average monthly high-tide
- 10% annual chance storm
- 1% annual chance storm

Coastal flooding risk will increase over the coming decades. Synergies with heat resilience are possible with waterfront strategies that reduce flood risk.



Heat event hours
Modeling based on July 2019 data

- More than 37 hours
- Less than 25 hours

Extreme heat already affects all of Boston. Some areas experience longer, hotter high-heat conditions.

liveability, and planning for growth by expanding the city's housing supply and implementing new anti-displacement strategies to support residents in the face of gentrification.

Governance structures

Planning & policy responses

In the 2022 Massachusetts Climate Change Assessment, Massachusetts named the costs associated with both in- and out-migration, including intra-state, inter-state, and international migration, as among the top three most urgent impacts of climate change on the state's governance sector. However, Boston has yet to identify any policies that are explicitly governing 'climate displacement.' That said, there are many existing policies at the city and state level related to housing production, transportation, and immigration, that will underpin the state and cities' capacity to respond to climate migration in the future.

Out-migration

In November 2023, the Healey administration launched a 'ResilientCoasts Initiative' with the directive to identify regulatory, policy, and funding mechanisms related to the impacts of climate change on the 78 coastal communities. Notably, 55 percent of residents living in these coastal communities are living in EJ Block Groups, which the state has identified as priority communities in their adaptation and mitigation climate planning. The state will create a typology of coastal communities called 'Coastal Resilience Districts' and work at a regional level to assess and recommend strategies for managing these impacts. One of the strategies under consideration is managed retreat. A recent study assessed how coastal municipalities in Massachusetts are thinking about the concept of managed retreat, the barriers and benefits, and the tools that would be supportive in this work.[1] Staff from 47 coastal municipalities shared concerns about the cost of managed retreat, including cost of land and moving or demolishing structures, lack of relocation sites, and loss of tax revenue. Many also cited the barrier of engaging with the public on such a fraught topic. The state's Chief Coastal Resilience Officer recognizes the need for a coordinated approach beyond the municipal scale: 'if there's going to be a movement towards managed retreat it has to be from the state'. Additionally, the Massachusetts Emergency Management Agency (MEMA) has been tasked with leading an evaluation of a statewide buyout program, referencing successful programs in NJ, OH, and NC such as a voluntary property acquisition program for EJ communities for whom repairing homes after flooding is financially inaccessible.

[1] Buchanan, Maya K, Scott Kulp, Lara Cushing, Rachel Morello-Frosch, Todd Nedwick, and Benjamin Strauss. "Sea Level Rise and Coastal Flooding Threaten Affordable Housing." Environmental Research Letters 15, no. 12 (2020): 124020. https://doi.org/10.1088/1748-9326/abb266.

In-migration

Massachusetts is expected to receive in-migration from both other parts of the U.S. and from around the globe, as well as migration within the state due to coastal communities moving inland. According to the FEMA Risk Index rating, Suffolk County, home to Boston, has 'Relatively Moderate' risk based on the county's (1) expected annual economic loss due to climate change - relatively moderate, (2) social vulnerability - relatively high, and (3) community resilience - very high. Seventy-nine percent of counties in the state have a lower risk index, as do 93 percent of U.S. counties. While Boston as a city may not end up being a net receiving city of climate migrants as it is affected by SLR, it is essential to consider the regional impacts of such in-migration.

The 2023 ResilientMass plan, which again named migration as a 'priority impact' on the state's governance, tasked the Executive Office of Energy and Environmental Affairs with conducting an assessment of climate migration that addresses where in-migrants will be coming from, which communities are likely to serve as receiving cities, and the potential impact of this migration on local environments, community amenities, jobs, and the economy. The state also calls for scenario planning to help prepare for different conditions. This initiative is listed as medium priority, not yet started, and projected to take over five years. Given the urgency of coastal resiliency for the state, there are fewer clear policy recommendations and pathways for municipalities who may end up being receiving cities.

Massachusetts' housing shortage

Housing is one of the largest concerns related to an influx of residents into Massachusetts, as the state is already facing a shortage. The state is projected to be 200,000 units behind its needs by 2030. While not tied explicitly to climate in-migration, recent policies passed to encourage housing development include a provision for the 2024 Affordable Homes Act to allow accessory dwelling units by right in all single-family lots across the state, and the 2021 MBTA Communities Act which requires that all communities hosting or abutting a community with service from the Massachusetts Bay Transit Authority (MBTA) upzone to meet new density requirements. Mayor Wu has laid out a vision for Boston to reach a peak population of 800,000 (the current population is 650,000). In order to plan for this growth, Boston has been a leader in promoting housing development – and particularly affordable housing – across the city. Initiatives to increase development in the city include a modernization of the Article 80 zoning process and the Squares and Streets Initiative.

Despite these efforts, the City and state have already struggled to meet the housing needs of the large influx of migrant families that have arrived in recent years. Between

fall 2022 and fall 2023, the state documented the arrival of 11,000 migrants. The state's Right to Shelter policy, first enacted in 1983 as the first and only state-wide policy in the country, has generally kept the state's unsheltered homelessness rate very low. Under great strain, the Governor has recently enacted a number of restrictions limiting the length of stay in the shelter systems, evicting many families who have no other options. The lack of capacity in the current shelter system raises concerns about the capacity to receive climate migrants following extreme weather events.

Green and climate gentrification

The potential for displacement of current residents, and an influx of new residents, will likely exacerbate the current housing crisis and escalate gentrification in Boston neighbourhoods. Currently, 42 percent of households in Boston are considered housing cost burdened, spending more than 30 percent of their income on housing; this figure rises to 50 percent for renters, with 30 percent severely housing cost burdened. Low vacancy rates are driving up both sale and rental prices, intensifying pressures on lower- and even middle-income residents. In 2020, Boston was named the third most gentrified city in the U.S. – while many factors are to blame, green infrastructure has now emerged as a prevalent gentrifying and displacing force. Greening and climate adaptation strategies have been shown to trigger 'green gentrification,' accelerating luxury real estate development and displacing low-income populations. For example, new resilient development projects in East Boston have provided unequal climate protection – low-income residents living behind them lost 'storm buffer space' and experienced flooding from the concrete used everywhere in the new developments. At the same time low-income homeowners are concerned about increased property tax bills and home insurance due to flood risk.

In another example of green gentrification, the Seaport neighbourhood features buildings and landscaping designed to deal with SLR and flooding, offering wealthier residents climate security while excluding lower-income groups. Built on reclaimed brownfield land, this development has not triggered direct displacement – instead, it has led to the exclusionary displacement of low-income residents by pricing them out of the area. Unlike some coastal cities, such as Miami, where early signs of 'climate gentrification' show wealthier residents moving inland to less risky, previously low-income areas, there is no clear evidence of this pattern in Boston.

The City of Boston recently (December 2024) released its Anti-displacement Existing Toolkit and Progress Report, which states 'Gentrification is acknowledged to also include the ways that climate change, and responses to it, may

Boston anti-displacement plan: New tools to mitigate climate risks

As of the publication of this case study, the City of Boston has released its municipal anti-displacement action plan: A Place to Thrive. This plan makes major strides in protecting vulnerable populations from residential displacement, largely focusing on the market-based displacement factors of gentrification and neighbourhood change, as well as tackling displacement from evictions. Climate factors are mentioned in the plan, but are only featured briefly, with some new tools to mitigate climate displacement risks:

- Basement Unit Protections: a request for funding to pilot a flood resilience audit and retrofit program for flood-prone units, including subgrade units, with the initial phase of work to be piloted in East Boston.
- Community Rating System (CRS): The City will work to join the federal CRS program, which will help to lower flood insurance premiums for its residents. The CRS incentivizes communities to exceed the minimum requirements of the National Flood Insurance Program.
- The City will provide preferential access to the income-restricted housing lottery for residents displaced by economic, social, or natural factors.

impact property markets and neighbourhood change patterns'. This is a significant addition to Boston's anti-displacement repertoire, and it makes public, for the first time, both the threat of 'green gentrification' and 'climate gentrification.'

Conclusion and future policy considerations

As Boston contends with rising sea levels, increasing heat, and intensified rainfall, the threat of displacement of its own residents looms large. At the same time, Boston's long-standing reputation as a 'space of refuge' could make it a destination for climate refugees, both domestic and international. Historically, the city played a key role in the Underground Railroad, and more recently, it is a Sanctuary City. Significant challenges remain in preparing for this potential influx. Recent research on green gentrification for the Boston Climate Action Network (BCAN) concludes that successful mitigation policies must focus on the neighbourhood scale and involve local communities in agenda-setting and policymaking.

Looking ahead, a more cohesive state-level strategy that considers climate migration and housing stress as interconnected issues is needed to help municipalities plan for these changes. Although planning is underway for coastal cities, engaging in-land municipalities and regional

planning bodies in long-term planning about the possibility for these communities to become receiving cities is equally important. Boston and the state need to use their 'whole/all-of-government' approach to climate displacement to integrate future policy challenges and opportunities in housing, transportation, immigration, and workforce development (e.g., using this as an opportunity to address workforce shortages statewide). The topic of managed retreat, though challenging and politically sensitive, should remain part of the conversation at both state and municipal levels. Proactive discussions, grounded in community engagement and transparent planning, are essential for preparing communities to face tough decisions ahead and to build resilient, adaptable cities.

Improving data-driven decision-making will also be key to these efforts. While Boston and the state have made strides in using localized climate risk data, more granular data on climate-related displacement triggers – whether temporary or permanent – is needed. The absence of a national database tracking climate migration is a major shortcoming, but Massachusetts could set precedent by developing state-level tracking mechanisms that other regions can model. This data would provide crucial evidence for conversations with state and local leaders, emphasizing that climate displacement is not a distant threat but a current issue.

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