

**Resilient
City**



**Resilient
People**



This a public summary for Resilient Cambridge.

- 6 What is climate change?
- 8 What we're doing about climate change.
 - ↳ Closer Neighborhoods
 - ↳ Better Buildings
 - ↳ Stronger Infrastructure
 - ↳ Greener City
- 22 How Cambridge is adapting for a resilient future.
- 30 Your role in our future: What you can do to help.
- 32 A broad view of a serious issue.
- 34 Let's work together to build a Resilient Cambridge.



While climate change poses a growing threat to our City, there are many things we can do to reduce the risk and severity of its effects.

Among them:

- Strengthen community organizations that provide essential services to residents and businesses
- Make our buildings flood- and heat-resilient, and require climate-resilience design standards on new developments
- Plant more trees and create additional green spaces on public and private property to combat rising temperatures and energy demand
- Work together with neighboring cities and the state to minimize flooding

What is climate change?

Climate change refers to long-term changes in weather patterns that impact our environment and way of life. The science is clear: Our climate is not the same as the one that our cities were built to accommodate, and the pace of change is accelerating.

Climate change will bring extreme heat, severe storms, and extensive flooding.

All three may affect our health and comfort, cause damage to our homes and schools, and threaten our access to reliable energy and safe drinking water.

The City of Cambridge is ready to meet these challenges.

In this document, you'll learn about what needs to be done, what Cambridge is already doing, and the important role that you can play in making our City more resilient in the face of a changing climate.

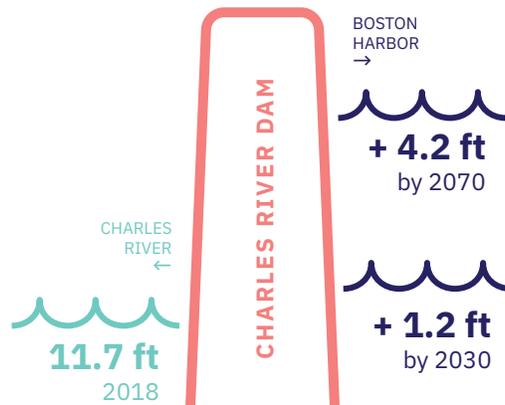
How bad it gets depends on the actions that we take now.

We can't prevent or reverse climate change by ourselves at the local level, but we can adapt to its current effects and take action to prepare for the future.

1 →

Flooding

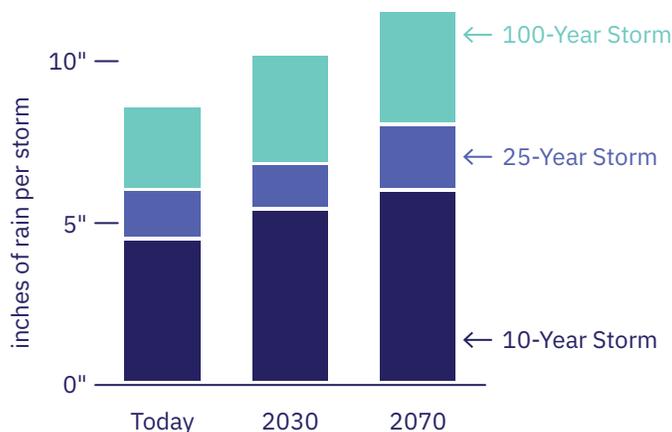
The average sea level in Boston Harbor is expected to rise steadily in the coming decades. A massive storm in 2070 could overtop the dams and cause significant flooding.



2 ↘

Severe Storms

Precipitation projections show that today's 25-year storm will be comparable to a 10-year storm in 2070.



3 ↓

Extreme heat

By the 2030s, average summer heat index in the City can be around 95°F, and by the 2070s, average summer heat index can be as high as 110°F.

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Today

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

2030

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

2070

The number of days over 90°F is increasing.

← Above 90°F (Low Scenario)

← Above 100°F (Low Scenario)

← Above 90°F (High Scenario)

← Above 100°F (High Scenario)

What we're doing about climate change.

Cambridge was not designed or built for the climate challenges we're facing today, and big changes will need to be made to address the changing climate. Cambridge is ready to make those changes.

A broad-based, multidisciplinary initiative called Resilient Cambridge has been working hard for several years to plan ways to reduce the risks of potentially devastating storms and floods, and to mitigate rising temperatures.

Resilient Cambridge is made up of four key areas of focus: **Closer Neighborhoods**, **Better Buildings**, **Stronger Infrastructure**, and **Greener City**. This effort builds on prior work the City has done such as the Net Zero Plan, designed to reduce greenhouse gas emissions that are a major contributing factor of climate change.

There is no single solution to climate change. We must all work together to ensure a resilient future for Cambridge.

1 Closer Neighborhoods

The ways people who live and work here, and the social networks that connect us, can be an important part of the solution.

2 Better Buildings

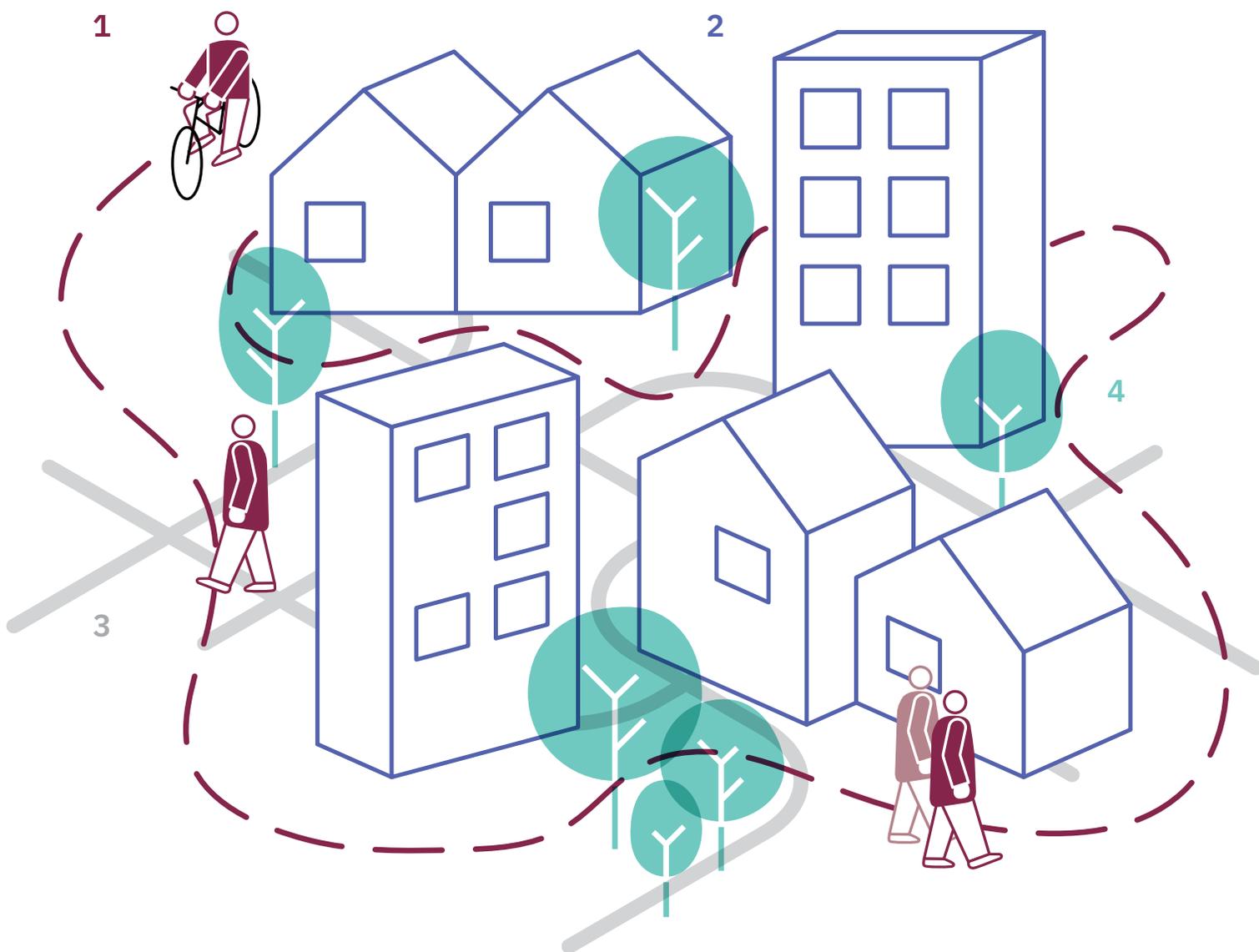
The City's built environment was constructed in an earlier time without awareness of the issues we face today.

3 Stronger Infrastructure

The systems that keep the City running—such as energy, communication, transportation, and water—need strengthening.

4 Greener City

While the natural environment itself needs protection, it can also be a key to combating climate change effects.



Closer

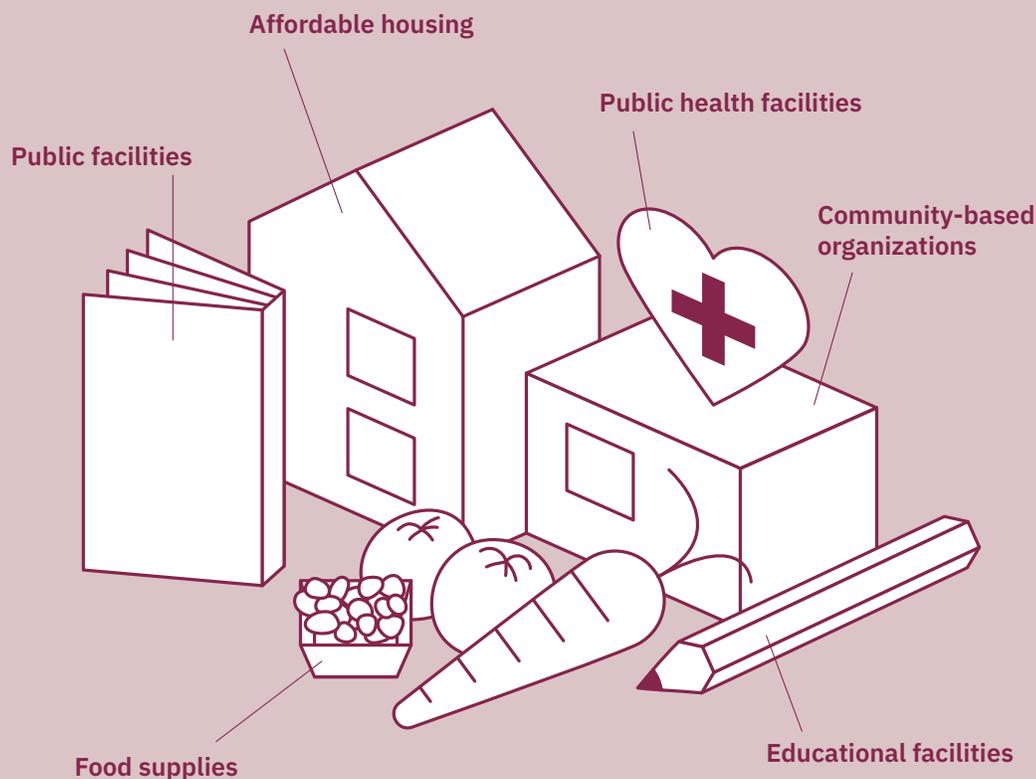
Because we're all
in this together

Neighborhoods

Success will depend on the strength and resilience of our social networks: family, friends, and neighbors; work, school, and religious, cultural, and community organizations; and City services and resources.



A key indicator of a prepared, connected community is the density and diversity of community resources available for building networks and providing critical support in times of crisis.



In order to stay strong in the face of growing climate change effects, we all need to work together and support each other: neighbors helping neighbors, businesses assisting their communities, and the City doing what's right for our residents.

For a number of reasons—varying education levels, health issues, socio-economic status, and language barriers among them—some of our neighbors may have difficulty adapting to and coping with climate change and may need support and help. We must ensure that everyone has access to clear, manageable, multilingual information about climate change risk, preparedness, and recovery. The City will also work to reduce systemic and structural obstacles for change to populations at risk by providing them with enhanced access to resources and helping them respond to extreme weather events.

Better Buildings

Structural solutions
for the future

The goal is for all buildings to sustain functionality against floods, increasing temperatures, and extreme heat.

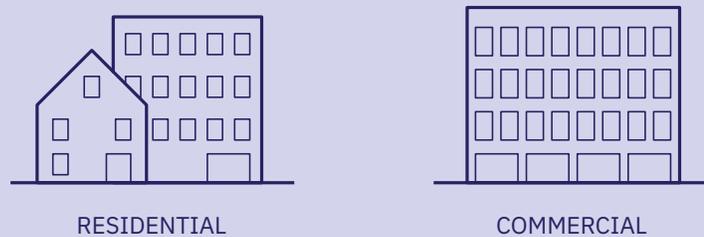
City of Cambridge Resilient City → Resilient People



The oldest building in Cambridge is a house that was built in 1681—nearly a century before the Declaration of Independence. The newest buildings are currently in development. Whether a building is 200 or 2 years old, it will need to be climate-ready.

Better Buildings identifies ways that Cambridge residents, property owners, and developers can adapt today’s buildings, and also sets rigorous standards for new construction, such as “green” design that can reduce urban heat, protect against flooding, conserve energy usage, and contribute to better stormwater management. The Better Buildings strategies will help to reduce the risk of damage caused by severe storms and flooding. Buildings that are energy efficient and use renewable energy and storage can weather disruption from storms and increasing temperatures, while also helping reduce the pollution that causes climate change.

The relative cost of implementing resiliency strategies for residential and commercial buildings. More dots = higher cost.



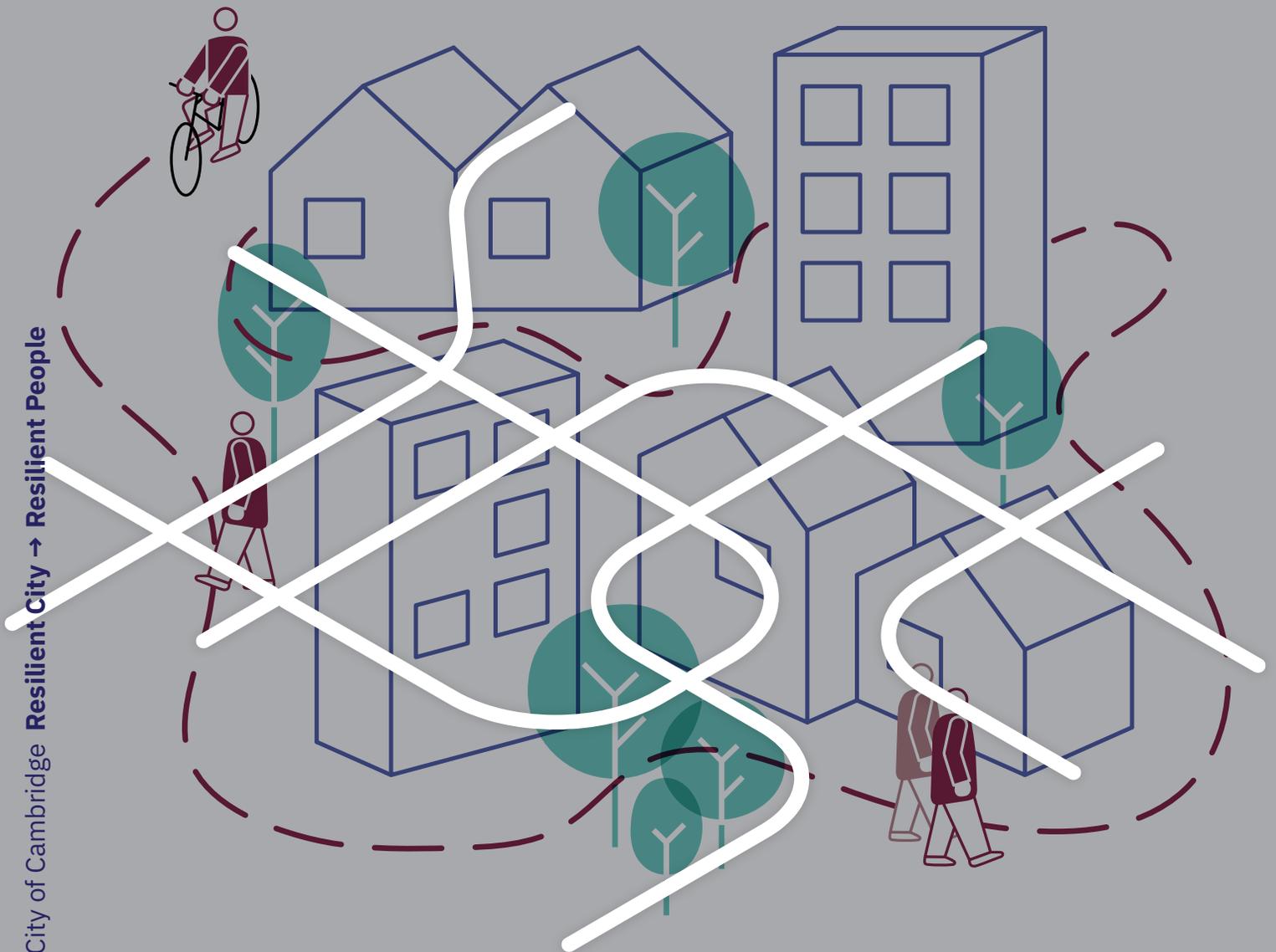
	1-3 Units	4-25 Units	26+ Units	Small	R&D/Large	
Flooding	Dry floodproofing	••	••••	••••	••••	
	Elevation of critical systems	••••••	••••••	••••••	••••••	
	Elevation of structure	••••••	×	×	×	
	Green infrastructure	•••	•••	•••	•••	•••
	Impervious surface replacement	•	•••	•••	•••	••••••
	Secure critical systems	••••	••••••	••••••	••••••	••••••
	Water alarms	•	•	•	•	•
Heat	Wet floodproofing	•••	•••	•••	••••	
	Cool roofs	••	••••	••••	••••	
	Energy storage	•••	••••••	••••••	••••••	
	Green roofs	••••	••••••	••••••	••••••	
	Operable windows/shading	•••	•••	•••	••••••	••••••

Stronger

Ensuring our systems
are sustainable

Infrastructure

Anticipated stresses due to climate change provide an opportunity to reimagine our systems. The City of Cambridge will partner with state agencies and service providers to ensure a seamless approach to adapting our infrastructure to climate stresses.



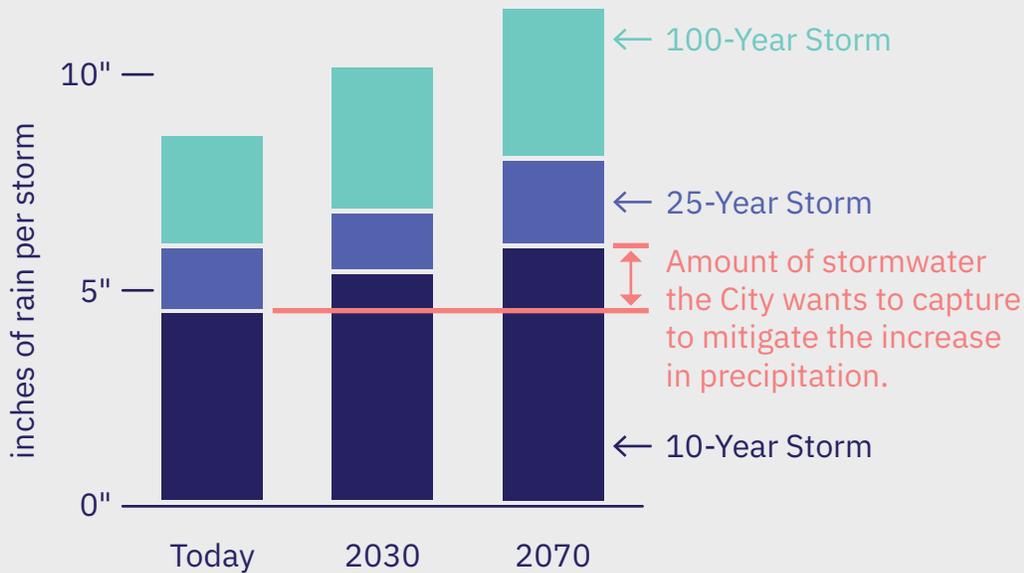
Cambridge is a city with complex energy, communication, transportation, and water systems—in many cases, these infrastructure elements are tied to regional systems. In the face of climate change, our current infrastructure does not adequately meet the needs of the future.

We will need to enhance our systems to adapt to increased flood elevations caused by extreme precipitation, sea level rise, and storm surge. Transportation and communication networks will need to be modified and upgraded, and higher temperatures will drive increased energy demand in the summer, requiring a fortified electric grid.



The PL6 tank in The Port

Resilient Cambridge’s Stronger Infrastructure strategies include targets for mitigating flooding, adapting energy and telecommunication infrastructure facilities and systems, supporting resilient mobility, and protecting Fresh Pond Reservoir, our drinking water supply.



The City is committed to stormwater infrastructure improvements so that flooding from a 10-year storm by 2070 is no worse than a 10-year storm of today.

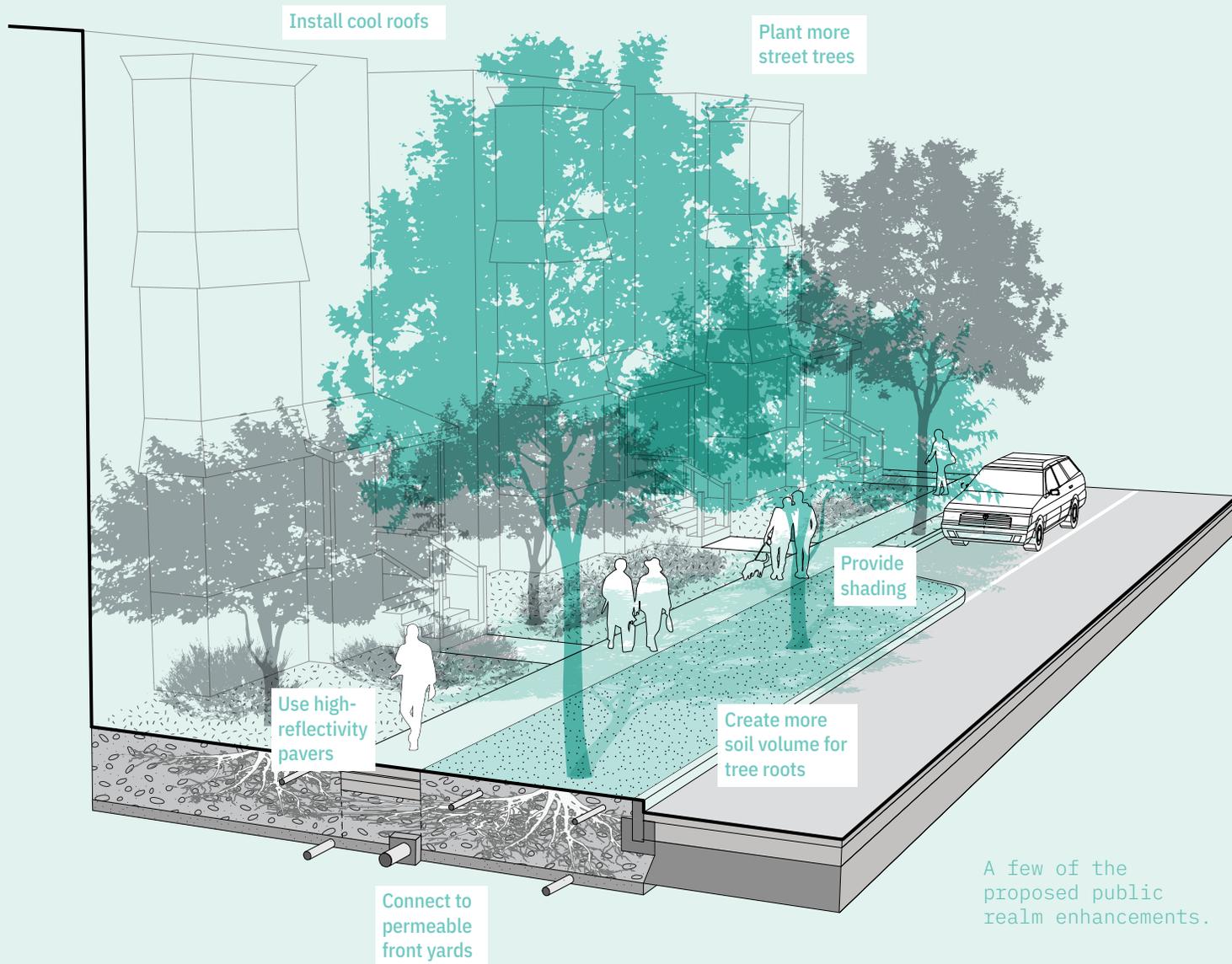
Greener City

Making space
for nature

Cambridge is a dense city that has more hard surfaces and less vegetation. We plan to make improvements to public spaces like street corridor parks and support increasing tree canopy and plant cover on private properties.

City of Cambridge Resilient City → Resilient People





Cambridge's living systems—its trees, parks, green spaces, and waterways—are pleasant to look at and visit; best of all, they provide shade, clean air, and can lower temperatures. We need to protect services and add more of them to our City.

Hard, dark surfaces like roads, parking lots, and roofs increase local temperatures, but natural settings and light-colored surfaces make the air cooler. As a result, cities are usually warmer than suburban and rural areas, a phenomenon known as the urban heat island (UHI).

The goals of the Greener City aspect of Resilient Cambridge cover four categories: increased vegetated areas (including roofs), expanded urban tree canopy and shade, enhanced access to open space and clean air, and improved health and protection of waterways.

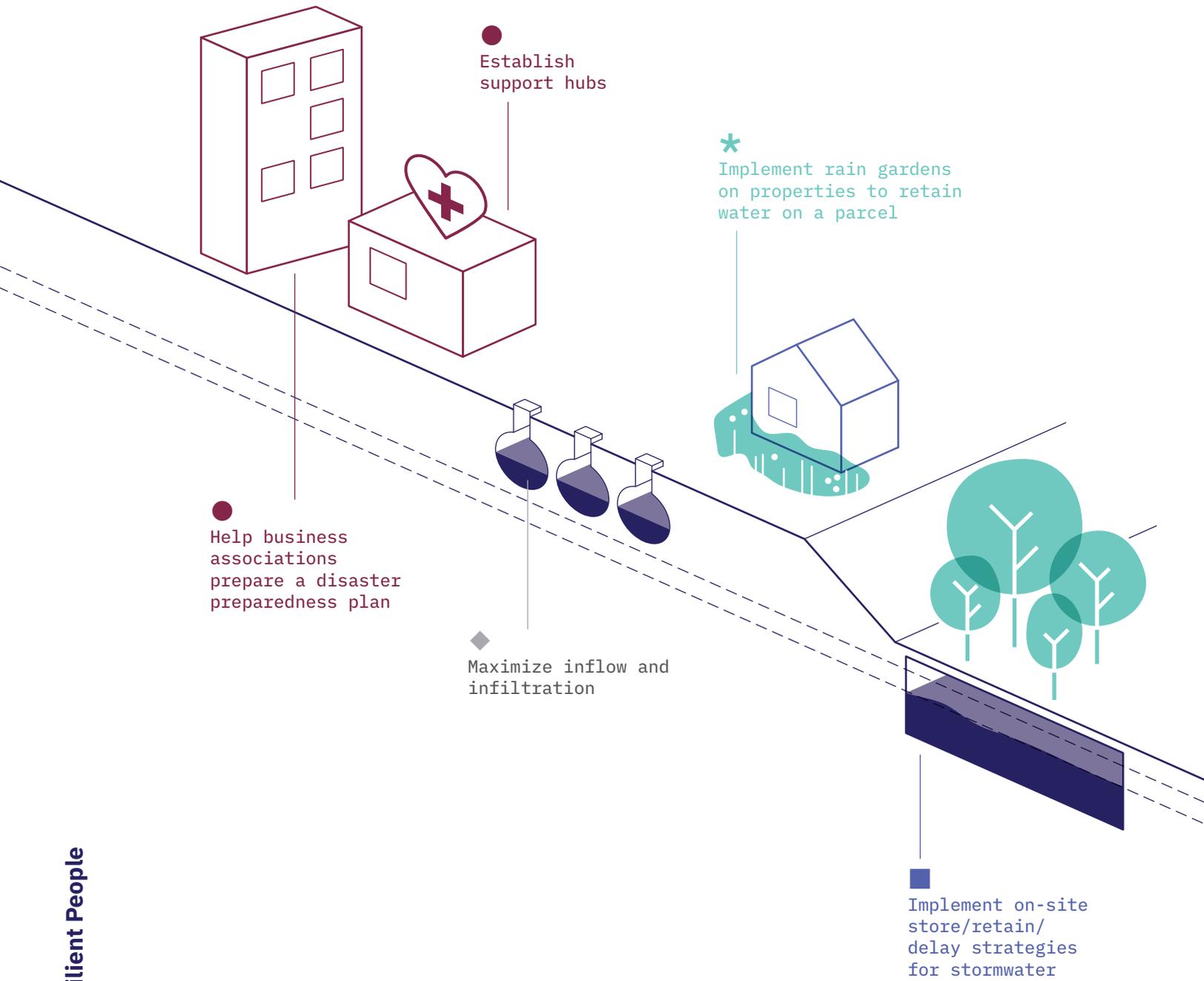
Visions of a transformed city.



We can't predict the future, but we can plan for it. The science tells us that climate change will have significant impacts on the planet. But we envision a prepared city that is able to rise to the challenges of climate change—if we take responsible action now. Let's imagine that transformed city together.

This vision includes cool streets surrounded by green spaces and trees; energy-efficient buildings powered by clean energy and storage; more planted areas to manage flooding and heat; a region cooperating to manage coastal storm surges; public infrastructure that can withstand and recover from flooding and extreme heat; and people helping and watching out for each other.





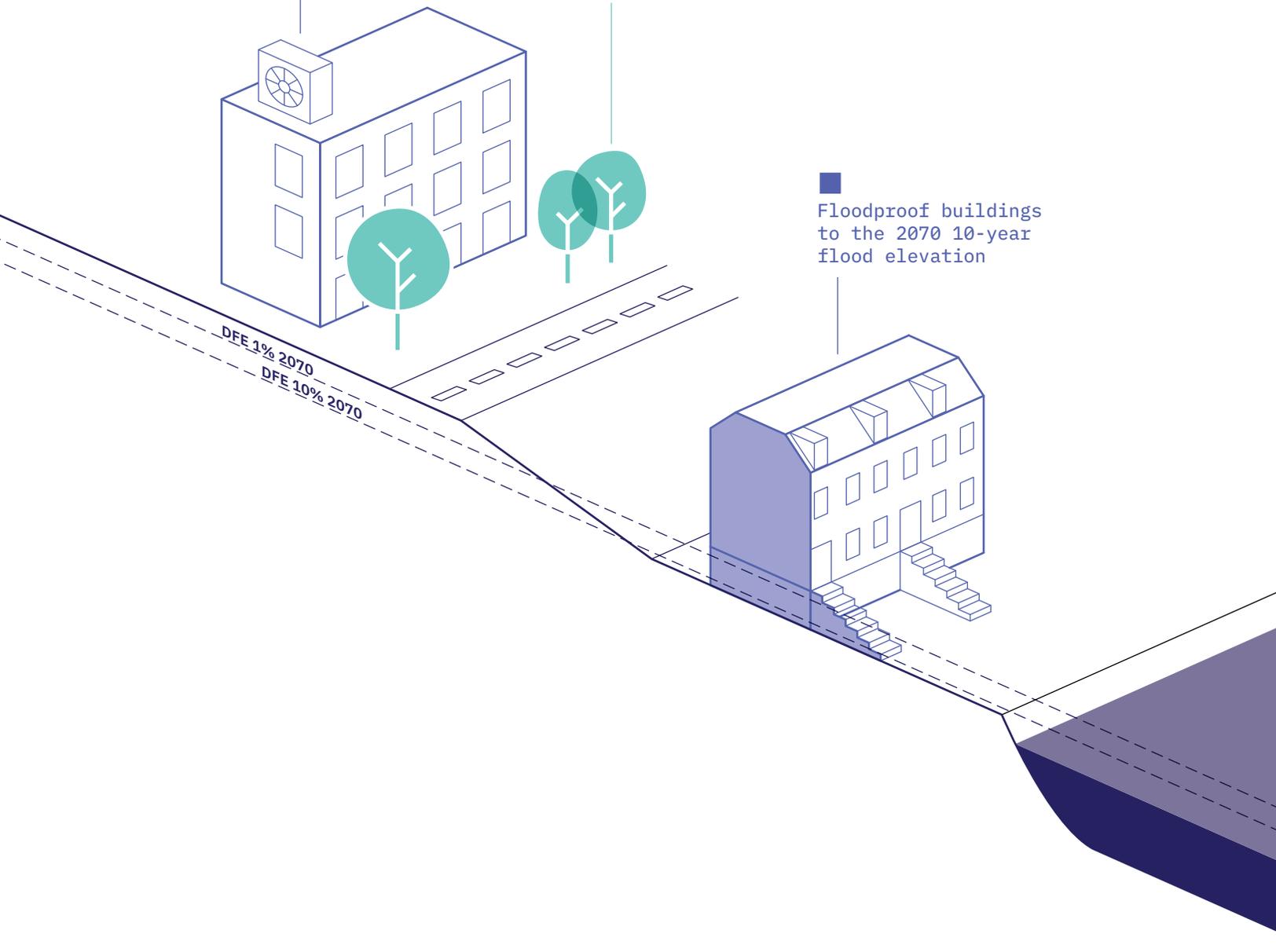
We are committed to do everything we can to mitigate flood risks and enhance the richness of our natural environment. We will have buildings designed with cool roofs and key utilities located above projected flood elevations. We will emphasize green and gray infrastructure—combining natural systems like the urban forest with a strengthened system of dams, pipes, and roads. Taken together, these actions will help achieve a resilient Cambridge.

- Closer Neighborhoods
- Better Buildings
- ◆ Stronger Infrastructure
- ★ Greener City

■ Elevate or protect vulnerable utilities such as fuel storage, furnaces, and electrical panels above 2070 10-year flood elevation

★ Plant green infrastructure in public right-of-way

■ Floodproof buildings to the 2070 10-year flood elevation



How Cambridge is adapting for a resilient future.

It is important to understand the three key potential impacts of our changing climate.

Extreme heat

Average summer temperatures in Cambridge are expected to increase 4 degrees above baseline averages, tripling the number of days each year above 90 degrees.

Severe storms

The increasing probability of Cambridge receiving more severe rainstorms may overwhelm our stormwater infrastructure, leading to frequent and severe flooding in the future.

Extensive flooding

The first Charles River Dam (built in 1910) and the Amelia Earhart Dam on the Mystic River (1966) were not designed for rising sea levels, and are at risk of being breached in the next 20-30 years.

Over the last several years, the City of Cambridge has studied these potential effects of climate change and developed a comprehensive plan to reduce the severity of those impacts. This plan includes bold new policies, programs, and infrastructure redesigns that, with your help, will ensure a stronger, healthier, and more connected City for all of us.

A Better Building: Thoughtful planning and green design

Finch Cambridge, a housing project in the Alewife Quadrangle area, incorporated resiliency and sustainability best practices in its design. The development exceeds energy efficiency standards and can withstand extreme heat, power outages, and flood impacts. Residential units are located above projected future flood elevations, while the ground level includes essential services that can easily rebound from flooding. A community room located on the upper level, above the flood elevation, can function as an emergency shelter-in-place location.



Mitigating stormwater flooding

One example of the work we're doing to prepare is a set of recommendations to address the potential of stormwater flooding due to extreme precipitation. They include:

- ↳ Integrate findings from the citywide analysis about where green/gray infrastructure strategies can be implemented into the design of priority projects—such as sewer and drain infrastructure plans, sidewalk and street reconstruction plans, sewer overflow management plans, and a plan for open spaces.
- ↳ Consider the potential flood and heat mitigation benefits of individual projects as part of ongoing capital improvement planning.
- ↳ Retrofit catch basins within areas of greatest green infrastructure opportunity, and replace them with leaching catch basins that permit runoff into the ground—as existing soil conditions allow.
- ↳ Map out soil conditions, ground water, and soil contamination conditions to help identify locations where infiltration systems are suitable.

From wasteland to wetland

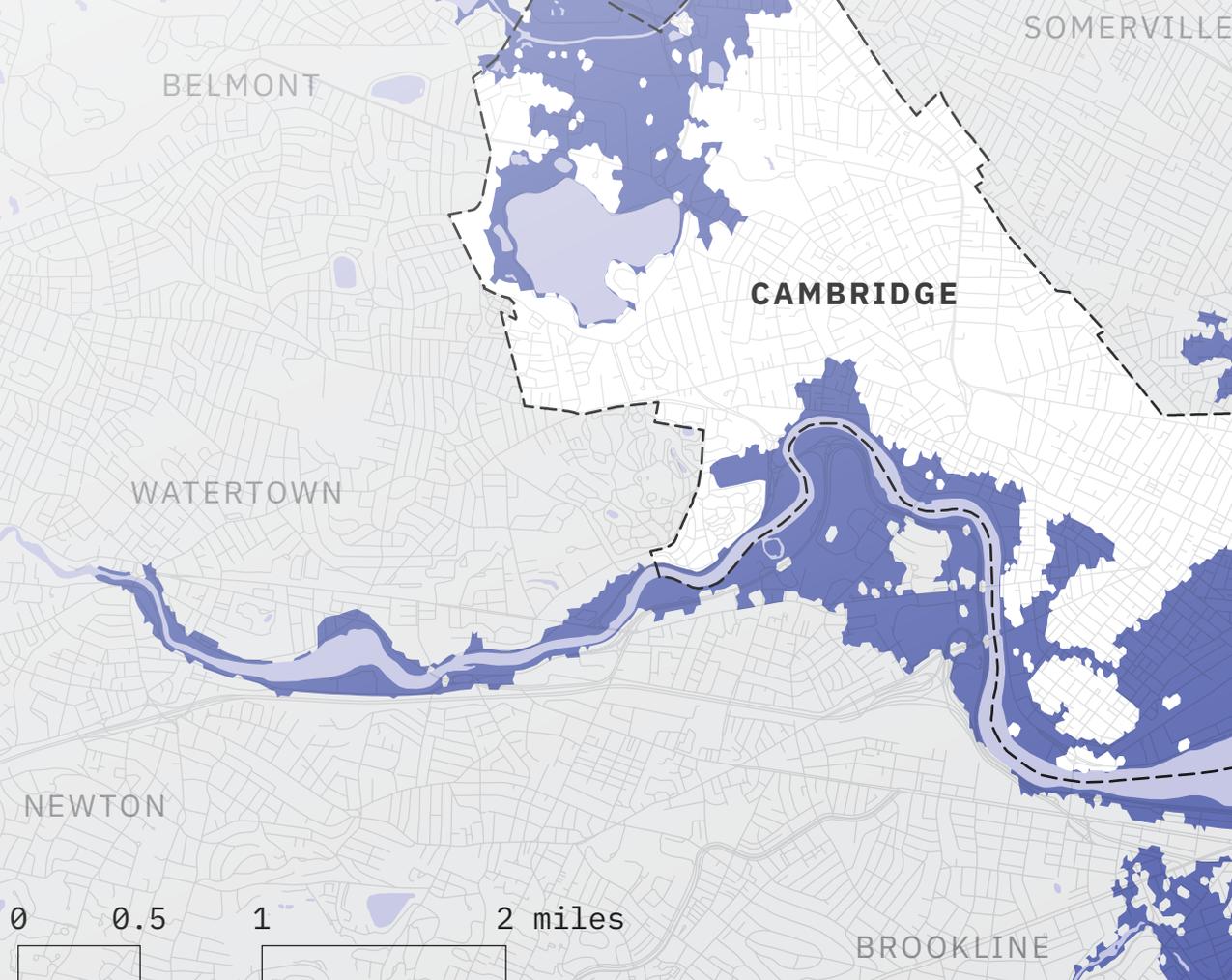
The Alewife Stormwater Wetland Project, part of the federally mandated Boston Harbor Cleanup, turned an ignored parcel of land into a stormwater treatment resource that reduces the risk of flooding. The result of a collaboration of engineering firms and state and local agencies, the one-time eyesore now boasts healthy vegetation, improved water quality, and is a place that both residents and wildlife like to visit. In the words of the federal judge overseeing the Boston Harbor Cleanup, the Alewife wetland is “an environmental miracle.”



Flooding extents of a 2070 coastal storm

The average sea level in Boston Harbor is expected to rise steadily in the coming decades: 1.2 feet by 2030, 2.4 feet by 2050, 4.2 feet by 2070. Because of this, the Amelia Earhart and Mystic River dams are at risk of being overtopped in the future. A massive storm in 2070 could cause significant flooding and damage over an enormous area, affecting as many as 15 communities.

City of Cambridge Resilient City → Resilient People





MELROSE

SAUGUS

MALDEN

REVERE

EVERETT

CHELSEA

WINTHROP

BOSTON

2070 1% FLOOD

Flooding mitigated by proposed interventions

The City of Cambridge estimates that with the proper interventions, more than 6,100 acres of land area could be made more resilient. Mitigating flooding from a massive storm would protect over \$58 billion of real estate value within the Mystic River and Charles River watersheds—over \$25 billion of which is in Cambridge—affecting more than 108,000 people.

City of Cambridge Resilient City → Resilient People

0 0.5 1 2 miles

SOMERVILLE

BELMONT

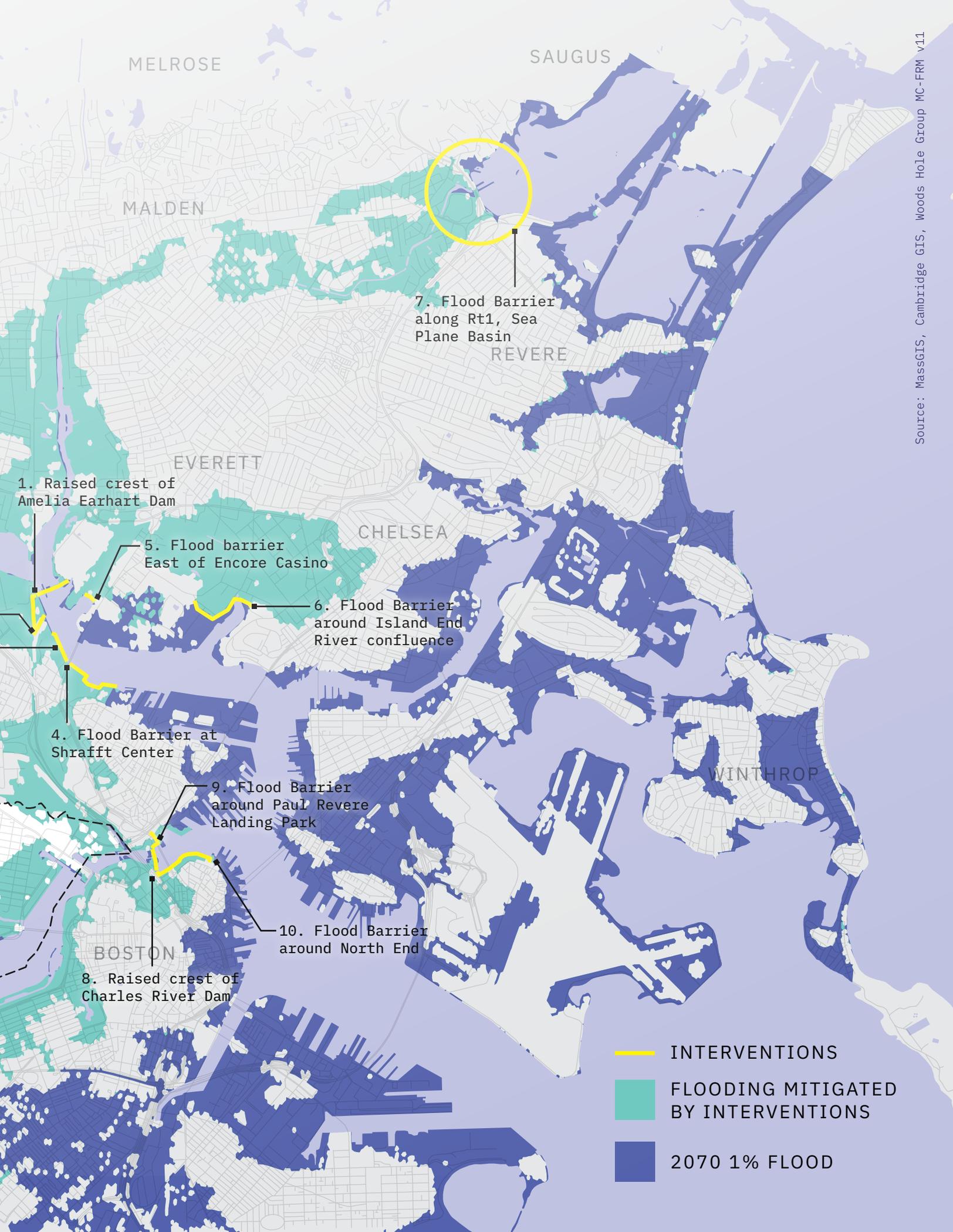
CAMBRIDGE

WATERTOWN

NEWTON

BROOKLINE

2. Flood Barrier at Draw 7 State Park
3. Increased height of flood barrier at MBTA bus depot - In construction



MELROSE

SAUGUS

MALDEN

7. Flood Barrier
along Rt1, Sea
Plane Basin

REVERE

EVERETT

1. Raised crest of
Amelia Earhart Dam

5. Flood barrier
East of Encore Casino

CHELSEA

6. Flood Barrier
around Island End
River confluence

4. Flood Barrier at
Shrafft Center

9. Flood Barrier
around Paul Revere
Landing Park

WINTHROP

8. Raised crest of
Charles River Dam

10. Flood Barrier
around North End

BOSTON

- INTERVENTIONS
- FLOODING MITIGATED BY INTERVENTIONS
- 2070 1% FLOOD

Your role in our future: What you can do to help.

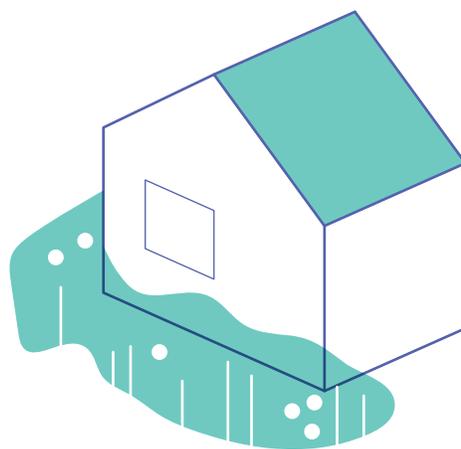
The City of Cambridge is taking a leadership role in adapting the community to the challenges of climate change. But to be successful, we need to collaborate with the residents and businesses of Cambridge. We all have a part to play, and we all have a lot to gain from working together.

We are hoping that residents and businesses will do all they can, and will make changes that will help our City be prepared for our climate future. In the context of the Resilient Cambridge initiative, we're asking for just few things from the public:

Learn as much as you can about climate change, and help to spread the word.

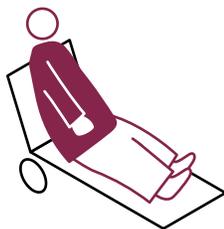


Look out for your neighbors and employees. Help them to understand climate change and how they can be part of this effort.



Investigating strategies such as green roofs, vegetated facades, and improvements to small lawn areas through ground, shrub, and tree planting can help us reach our goal. Do what you can to make our city greener (but be responsible with water usage).

In the heat of summer, make sure your neighbors (especially the elderly) are comfortable; if not, help them find a cooling center.



In winter, make sure drains and hydrants on your street are shoveled.



Home and building owners should incorporate resilience strategies in their construction and renovation projects; renters can help by preparing for emergencies in advance.

A broad view of a serious issue.

The Resilient Cambridge initiative is just the latest in a series of important efforts Cambridge leaders have undertaken to address both climate mitigation and adaptation. These initiatives include:

- ↳ The Envision Cambridge citywide plan, which highlights resiliency actions related to climate and the environment
- ↳ The Climate Change Vulnerability Assessment
- ↳ Preparedness plans for Alewife and The Port
- ↳ An updated Climate Action Plan aligned with the Net Zero Action Plan
- ↳ A comprehensive Urban Forest Master Plan to evaluate, maintain, and expand the urban forest canopy
- ↳ An Open Space Plan to enhance and strategize planning
- ↳ A Climate Resilience Zoning Task Force to build on climate planning efforts, with a focus on amending development standards
- ↳ Creation of the Alewife Stormwater Wetland, a significant enhancement of vegetation and hydrologic ecosystems and a noteworthy collaboration between the City's Department of Public Works with the State's Department of Conservation and Recreation
- ↳ Installation of a 400,000-gallon tank in The Port to reduce flooding from stormwater during precipitation events



Let's work together to build a Resilient Cambridge.

Cambridge is planning for a resilient future, but government action is not enough. We need the buy-in and momentum of all of our residents, businesses, and institutions to ensure that our City is able to adapt to the challenges of climate change.

This collaboration must also include our neighbors and our region. Ongoing discussions about resiliency with the Massachusetts Department of Conservation and Recreation, state agencies such as the Massachusetts Emergency Management Agency and the Executive Office of Energy and Environmental Affairs, Resilient Mystic Collaborative, the Charles River Climate Compact, and the Metro Mayors Climate Preparedness Task Force will help to bring about sustainable change.

We look forward to hearing your questions and working together to make Cambridge a model of how cities can adapt to mitigate the effects of climate change for generations to come.

Summary of the way forward

- PROPOSERS**
- City
 - ◊◊◊◊◊ State & Federal
 - Institutions
 - Partnerships

Closer Neighborhoods

Provide for neighborhood resilience hubs	Strengthen emergency communication systems	Enhance emergency response plans	Continue climate education
Enhance resilient public amenities	Support business and organizational preparedness	Provide for healthcare continuity and access	Support renter preparedness
Create support systems for populations at risk	Provide for resilient community facilities resource	Encourage stronger social network	

Better Buildings

Regulate flood protection for new buildings	Encourage heat protection for existing buildings	Establish adapted zoning policies and regulations	Develop flood protection and operations planning for historic and critical facilities
Regulate heat protection for new buildings	Support building management for flood and heat protection	Study adapted planning for urban blocks	
Encourage flood protection for existing buildings	Incite site green infrastructure	Encourage resiliency of building scale energy	

Stronger Infrastructure

Protect Fresh Pond Reservoir	Encourage the resiliency of the transportation system	Upgrade stormwater storage	Support sustainable energy infrastructure
Encourage the resiliency of the electrical distribution system	Continue combined sewer separation	Implement green infrastructure for stormwater management	Support a resilient telecommunication network

Greener City

Provide for a resilient urban forest	Reduce impervious area	Expand and improve open spaces
Enhance outdoor thermal comfort	Seek green infrastructure opportunities	

The City of Cambridge
Resilient City → Resilient People

View the Resilient Cambridge plan and other materials at
www.cambridgema.gov/ResilientCambridge



Kleinfelder
Libretto
OverUnder

© June 2021

