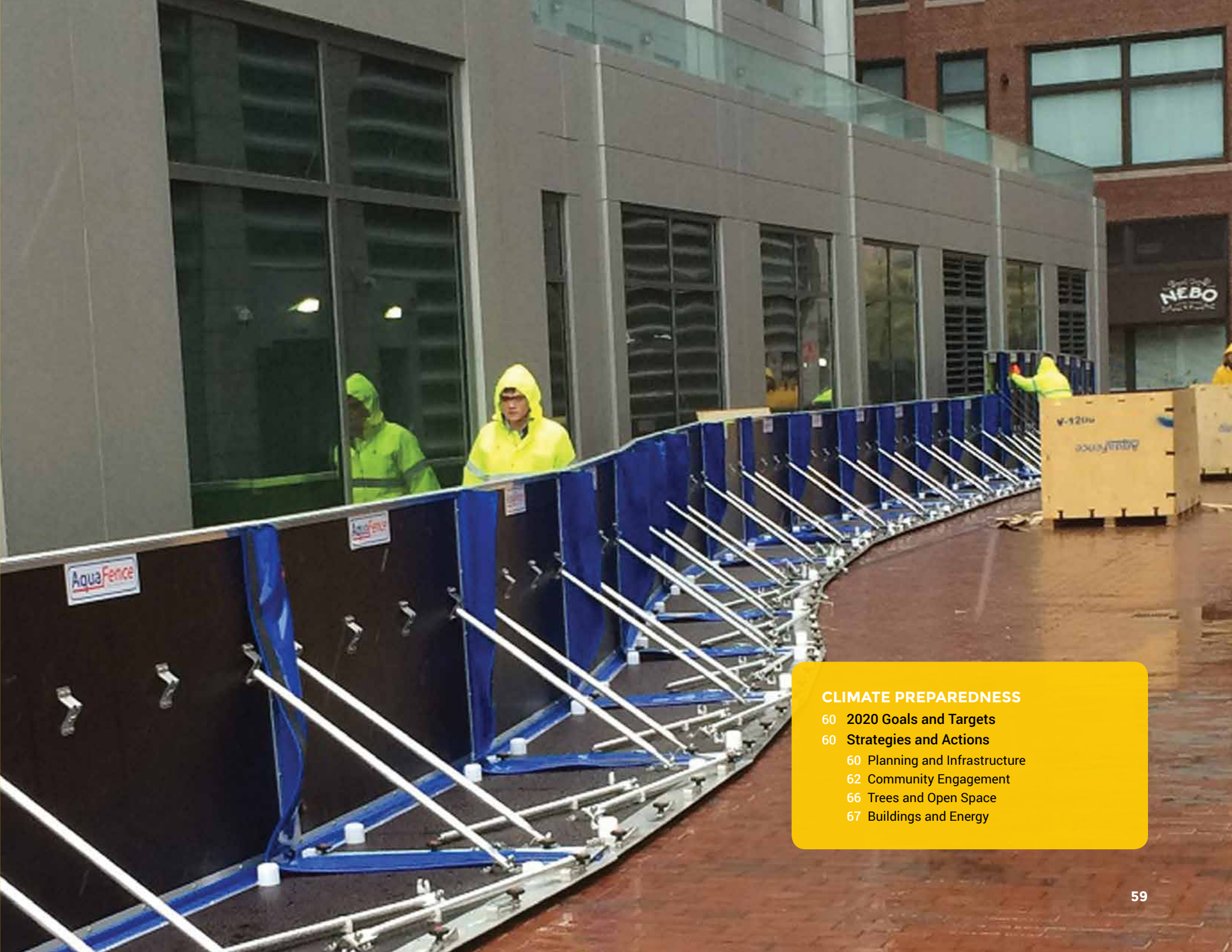


# CLIMATE PREPAREDNESS





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# CLIMATE PREPAREDNESS

## 2020 Goals and Targets

Whatever success Boston and the rest of the world have in reducing emissions of greenhouse gases, because of the accumulation of past carbon emissions, the climate will continue to change for many years. And the effects experienced in Boston—including rising sea-level, more frequent and intense heat waves, more intense storms, and other phenomena—will continue to grow in magnitude or frequency. Projections of climate change are usually expressed as ranges, (e.g., “between 16 and 29 additional days over 90 degrees every year by mid-century”), yet the direction and rough magnitude of changes are clear. Furthermore, the effects of climate change are visible in Boston now. We must adapt to the changes that have already occurred and begin preparing for those to come.

The 2014 Update continues the 2011 Plan’s theme of integrating climate preparedness into all planning, program development, and project reviews undertaken by the City. It also advances implementation through increased community and intergovernmental engagement. Lastly, as it has for many years, the City will strive to lead by example in preparing its own facilities and systems.

Because the City already touches the lives and businesses of its residents and visitors in so many ways, preparedness is tied with other programs that address public health, economic development, emergency planning, energy, and trees and open space. This work will include incorporation of climate change criteria in



*An artist's depiction of future sea-level rise along the East Boston waterfront.*

existing programs, information, guidelines, and other resources for individuals, businesses, and neighborhoods taking action on their own and, in some cases, new regulations or legislation. A vital aspect of climate preparedness is its long-term framework, anticipating the climate and environment of 25 or more years from now, while ensuring that Boston is ready for the risks that it faces now.

Unlike climate change mitigation, where the total amount of greenhouse gases emitted serves as the overriding measure of progress, there is no single

indicator that measures climate preparedness. The City will continue to monitor measures of risk, including sea-level averages, average annual temperature, number of days over 90 degrees Fahrenheit, and precipitation patterns. Some useful metrics are available in specific areas, such as the size of the city’s tree canopy, the proportion of impermeable pavement, and the number of people who have participated in outreach programs. The City is working with local researchers and other cities to understand and develop better indicators of urban and community preparedness that can be used to establish more concrete goals.

## Strategies and Actions

### PLANNING AND INFRASTRUCTURE

#### 1.1 INTEGRATE PREPAREDNESS INTO ALL ASPECTS OF CITY PLANNING, REVIEW, AND REGULATION

Under the CAP Update, this integration will be continued, strengthened, and expanded, with a goal of ensuring that every opportunity to improve Boston’s preparedness for climate change is exploited. All multi-year planning, permitting and other review processes will include analyses of and preparations for the effects of climate change. The City will coordinate these activities—for example, making sure that all offices are using similar climate projections and planning horizons—by ensuring that employees are appropriately trained and that high-level management is in place to establish cross-departmental consistency.

## CLIMATE PREPAREDNESS *continued*

### 1.1 ACTIONS

#### 1.11 Coordinate and prioritize citywide preparedness efforts

Raise the priority of climate preparedness as a key component of all City planning and ensure citywide coordination.



#### 1.12 Establish a long-term planning framework

Start planning for the end-of-century effects of climate change.



#### 1.13 Incorporate preparedness into all project and permit reviews

Continue to integrate climate preparedness into zoning, all project and permit review and licensing, and the regulations and guidelines that govern these processes. Review and improve waterfront development zoning.



### 1.2 COORDINATE PREPAREDNESS EFFORTS REGIONALLY AND WITH STATE AND FEDERAL GOVERNMENTS

The City of Boston lacks the authority to address many climate preparedness concerns because 1) important natural features and built infrastructure extend beyond Boston's boundaries (e.g., the Charles River or MBTA subway lines) or 2) legal authority is specifically reserved for another level of government (for example, state responsibility for the building code and regulation of energy utilities). Although informal staff contacts and semi-formal stakeholder groups involving the City,

neighboring municipalities, regional authorities, Commonwealth offices, and others have done much, the rising priority of and increasing activity around climate preparedness requires a stronger and more formal structure, which the City will lead. This work must go beyond planning documents and regulations to include active partnerships to identify and prepare vital regional infrastructure. Furthermore, regional coordination will encompass private property owners and businesses (see strategy 2.4) and the higher education community, which has interests in protecting its long-term physical presence in Boston and in generating, testing, and applying knowledge.

### 1.2 ACTIONS

#### 1.21 Convene a regional climate preparedness summit

Work with metro-Boston cities and towns, the Commonwealth, and regional authorities to align and accelerate regional preparedness planning, development of regulatory requirements, infrastructure investment, and other programs and policies.



#### 1.22 Develop city-university research partnerships

Develop a partnership with research universities to develop, analyze, test, and implement new climate-preparedness strategies; create a pipeline of green education and workforce opportunities for students.



### CROSS-CUTTING THEME

#### Economic Development

Climate preparedness is closely linked to economic development at both the large and the small scale. At the large scale, businesses will not choose to invest in Boston for the long term, and individuals and families will not choose to live here if the integrity of buildings, streets, public services, and essential infrastructure cannot be assured. On the other hand, climate preparedness will require investment in maintaining, upgrading, and modifying buildings, roads, parks, pipes, river beds, and much more, in projects large and small. The City will design programs and work with stakeholders to make those investments in ways that spur the creation of local, well-paying jobs and businesses. Finally, economic development in itself generally increases preparedness, because a strong, prosperous community has more individual and community resources with which to meet the stresses that come with climate change.

## CLIMATE PREPAREDNESS *continued*

### 1.3 LEAD BY EXAMPLE

The primary reason for the City of Boston to continue increasing the climate preparedness of its own operations is to ensure that City agencies can serve residents, workers, and visitors under all circumstances. For this purpose, the City will use the priorities identified in the October 2013 report *Climate Ready Boston: Municipal Vulnerability to Climate Change* as important factors in its capital budget decisions. The City's work on its facilities will also serve as examples and provide motivation for other property owners who may be struggling to determine what steps they should take. Furthermore, the City can use its facilities to serve as pilots for relatively new or innovative approaches such as, the use of district energy or combined heat-and-power installations as a general preparedness measure or the combination of photovoltaics with storage batteries as a source of emergency power.

#### 1.3 ACTIONS

##### 1.31 Address municipal vulnerabilities

Address municipal building, infrastructure, and operational vulnerabilities identified in the 2013 assessment, and report on progress annually.



##### 1.32 Pilot preparedness solutions

Use City-owned facilities and land to provide climate-preparedness examples and pilot innovative solutions.



## COMMUNITY ENGAGEMENT

### 2.1 USE CLIMATE PREPAREDNESS TO SPUR ECONOMIC DEVELOPMENT AND CREATE JOBS

Boston's energy programs have already had success in fostering local business creation and job growth while reducing energy use and greenhouse gas emissions. The City will ensure that its preparedness programs have a similar mindfulness to the potential for combining climate and economic goals. Just as with energy efficiency, climate preparedness (e.g., tree plantings, urban agriculture, infrastructure construction) requires work on the ground. Furthermore, neighborhoods that are healthier and stronger—in community cohesion, economic vitality, and public health—are, for that reason alone, better prepared for climate change and other stresses.

#### 2.1 ACTIONS

##### 2.11 Focus on neighborhood-level strategies

Work with community leaders, community development agencies, and others to create neighborhood-based programs and projects that increase climate preparedness for vulnerable populations, while supporting job training and job creation.



##### 2.12 Invest locally

Invest in smaller-scale resiliency interventions and pilots in particularly vulnerable areas and environmental justice communities.



*Rendering of a community garden and solar array atop a proposed Energy Positive development in Mission Hill.*

## CLIMATE PREPAREDNESS *continued*

### 2.2 TARGET ASSISTANCE TO LOW-INCOME RESIDENTS, SMALL BUSINESSES, AND OTHER VULNERABLE POPULATIONS AND ENTITIES

Although all segments of the Boston community face increasing risks from climate change, some segments are more vulnerable because of socioeconomic factors. The City of Boston will increase its efforts to inform particularly these groups about climate preparedness and to identify resources that could assist them in taking action. Small businesses also, in general, are more vulnerable to the increasing risks from climate change than large ones, and the City will reach out to them. In both cases, the City will try to build on existing programs that already serve these groups—through, for example, the Public Health Commission and the Department of Neighborhood Development. A final group that will require specific attention is workers, especially those who work outside and could suffer in extreme weather. The City will bring together stakeholders to explore formal and informal means of ensuring worker safety as the climate changes.

#### 2.2 ACTIONS

##### 2.21 Collaborate with public health

Add climate preparedness elements to public health programs already aimed at vulnerable populations and low-income households.



##### 2.22 Identify potential resources

Explore opportunities to provide financial and technical assistance to vulnerable populations and low-income households in reducing current vulnerabilities.



##### 2.23 Support the resiliency of small businesses

Work with Main Street programs and other stakeholders to assist small businesses in increasing preparedness and developing business continuity plans.



##### 2.24 Protect outdoor and manual workers

Work with unions, businesses, the Commonwealth, and other stakeholders to protect workers in extreme weather.



#### CROSS-CUTTING THEME

### Social Equity

The more vulnerable and lower-income populations in Boston tend to have more reliance on public services and fewer resources with which to take action to prepare or respond to the stresses of extreme weather. Therefore, the overall climate preparedness of the city, including its transportation, energy, and water infrastructure, is critical. More specifically, vulnerable populations are less likely, for example, to have air conditioning or are able to leave the city quickly in emergencies; this makes the preparedness of the City's emergency shelters and cooling centers, and the ability of these facilities to operate in extreme events, vital. Preparedness is a key component of community resilience and is defined by broader indicators of equity, health, safety, education, and economic vitality. The preparedness strategies for community engagement (see strategies 2.1 and 2.2) are intended to ensure that the needs of communities are heard and that public investments in preparedness are used, whenever possible, to increase their overall economic and social health.

## CLIMATE PREPAREDNESS *continued*

### 2.3 PROVIDE INFORMATION THAT ENABLES COMMUNITIES TO TAKE ACTION AND INFLUENCE PROGRAMS AND POLICIES

Climate change projections are generally stated as ranges (for example, between two inches and six feet of average global sea-level rise by 2100) associated with corresponding probabilities of certainty. This often makes planning and decision making difficult on such long horizons. To establish a consistent basis for preparing for climate change, the City of Boston will establish a set of climate scenarios (amounts of change at a given time) to be used for planning and other actions. These scenarios, however, only outline the risks that the city faces. The City will also develop a set of indicators that provide some objective measures of how well Boston is prepared to face those risks, and establish preparedness goals based, at least in part, on those indicators. Both sets of information—scenarios and indicators—will be important tools for informing the community about climate vulnerability, establishing bases for action, and providing a common understanding for citywide and neighborhood-specific discussions of preparedness priorities.

#### 2.3 ACTIONS

##### 2.31 Provide accessible climate data and projections



Ensure that all municipal offices and the community have up-to-date climate change projections and planning levels (scenarios) in sufficient detail to support neighborhood-level planning and design.

##### 2.32 Establish preparedness indicators

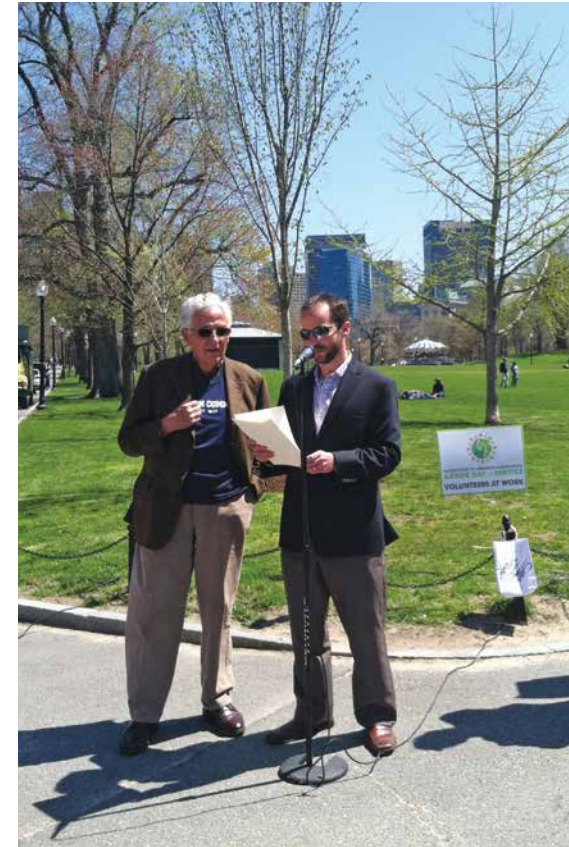


Develop a set of indicators to provide quantitative measures of the preparedness of the Boston community, set goals in terms of these indicators, and report on them annually.

##### 2.33 Improve and expand neighborhood engagement



Expand public outreach to neighborhood groups to inform and motivate all sectors of the community around preparedness, and better understand neighborhood needs and priorities.



*As part of the Massachusetts Arborists Association's annual Arbor Day of Service, Boston Parks and Recreation Department and the Friends of the Public Garden dedicate a tree to Henry Davis (pictured) for his lifetime of work towards the preservation of trees on the Boston Common.*

## CLIMATE PREPAREDNESS *continued*

### 2.4 SUPPORT PROPERTY AND BUILDING OWNERS AND INSTITUTIONS IN TAKING PREPAREDNESS ACTION

Property owners, businesses, and institutions have an essential role in climate preparedness because they must take responsibility for protecting their own material interests. In many cases, they also contribute directly to the preparedness of the community by providing services or places of refuge. Especially in the next couple of decades when climate changes are relatively small (compared with what is likely by the end of the century), changes to individual buildings and operating practices can improve preparedness significantly. The City will work with diverse stakeholders to provide practical information, raise awareness, and explore resources, especially for smaller property owners and businesses. The insurance and financial sectors, in particular, must be engaged. They often have considerable influence in, and can provide financial incentives for, establishing better practices, especially for existing buildings. The City must also pay special attention to businesses and properties with toxic or hazardous materials. Although it is the responsibility of the owners to ensure the security of these materials, the City—in an extension of the scrutiny it already gives such properties through its public safety offices—will re-examine their vulnerability in light of climate change.

#### 2.4 ACTIONS

##### 2.41 Provide preparedness information

Work with property owners, neighborhood groups, and other stakeholders to establish building preparedness priorities, best practices, guidelines for implementation, and cost/benefit information.



##### 2.42 Increase awareness of vulnerabilities and actions

Ensure that all property owners and tenants are specifically aware of their climate-change vulnerabilities.



##### 2.43 Expand resources

Explore mechanisms to provide property owners financial and technical support for increasing climate preparedness.



##### 2.44 Align insurance policies

Work with the Commonwealth, the insurance and finance sectors, and property owners to identify modifications to building codes, and align insurance policies and incentives, and underwrite loans to increase building resiliency.



##### 2.45 Assess vulnerabilities of hazardous materials and sites

Determine the vulnerability of sites with inventoried toxic/hazardous materials and other sites that may create greater vulnerability to the community and ways to increase their preparedness.



*Ceremonial opening of Green Alley, a joint project between Boston Architectural College (BAC) and Halvorson Design Partnership. Since its opening in October 2013, the Green Alley has captured almost all of the stormwater to recharge groundwater supply.*



## TREES AND OPEN SPACE

### 3.1 EXPAND GREEN INFRASTRUCTURE AND ECOSYSTEM-BASED APPROACHES TO ADDRESS CLIMATE VULNERABILITIES

Green infrastructure—parks, trees, wetlands, beaches, and other open space—is a valuable tool in climate preparedness, particularly for mitigating heat and stormwater, as well as for all the other benefits it brings. The City already enforces legal requirements for green infrastructure through, for example, protection of wetlands under the Commonwealth’s Wetlands Protection Act and of street trees under a municipal ordinance. It also has policies and programs that strongly encourage and facilitate green infrastructure, including Complete Street guidelines, stormwater management requirements under Boston Water and Sewer Commission regulations, the urban agriculture zoning code and programming, and tree-planting goals and initiatives. Of particular importance will be determining the appropriate ways of incorporating projected sea-level rise into legislation or regulation to both allow climate-prepared development where appropriate, and protect and expand coastal resources.

#### 3.1 ACTIONS

##### 3.11 Expand green infrastructure requirements

Explore legislative and regulatory means of expanding requirements for green infrastructure and coastal protection, such as through a local wetlands ordinance.



##### 3.12 Grow the urban tree canopy

Develop and implement a clear plan for significantly increasing tree-canopy cover.



##### 3.13 Explore a community-wide stormwater fee

This fee can be based on a property’s permeable surface area and stormwater management efforts.



##### 3.14 Accelerate neighborhood stormwater management actions

Explore a pavement-to-parks/water absorption plan for neighborhoods.



##### 3.15 Increase support and space for urban agriculture

Expand urban agriculture and study the resilience of Boston’s regional food system.



### Growing the Urban Forest

The urban forest is an important feature of Boston. Trees provide public health benefits like cleaner air, they keep us cool, absorb stormwater, and even increase property values and have been proven to reduce crime rates. However, growing and maintaining an urban forest is challenging. Trees often struggle in the city. They get damaged by people and cars, their roots are crushed by the weight of roads and sidewalks, and they often have a hard time getting water through concrete and pavement.

The City of Boston uses a variety of tools and resources throughout the community to support the city’s urban forest. Tree planting is considered in the Article 80 review process for new developments. The Parks Department is the agency with regulatory and operational responsibilities for public shade trees, including pruning, disease control, removals, and storm damage repairs. Community partnerships are critical for this work—from private developers or residents planting new trees, to citizens caring for street trees through the Adopt-a-Tree program, to community organizations, such as Boston Natural Areas Network, Southie Trees and the Boston Tree Party. This Plan calls for enhanced collaboration and partnerships to help Boston reach its tree canopy goal of 35 percent.

Learn more about how to get involved at [AdoptATree.GreenovateBoston.org](http://AdoptATree.GreenovateBoston.org).

## CLIMATE PREPAREDNESS *continued*

### BUILDINGS AND ENERGY

#### 4.1 EXPAND ENERGY EFFICIENCY, SOLAR AND OTHER TYPES OF DISTRIBUTED ENERGY AS A RESILIENCE MEASURE

The expansion of energy efficiency, renewable energy, and district energy are key components of the CAP's strategies to reduce greenhouse gas emissions. They also contribute to climate preparedness, because they make the city less reliant on the regional energy network, which itself will confront greater stresses with climate change (for example, greater demands for electricity during heat waves, greater physical stresses from more intense storms). This strategy and its actions call for increased recognition of the benefits that climate mitigation offers for climate preparedness.

#### 4.1 ACTIONS

##### 4.11 Expand distributed energy systems

Expand district energy, combined heat and power, and other types of distributed energy and storage, particularly in districts with vulnerable populations and critical facilities.

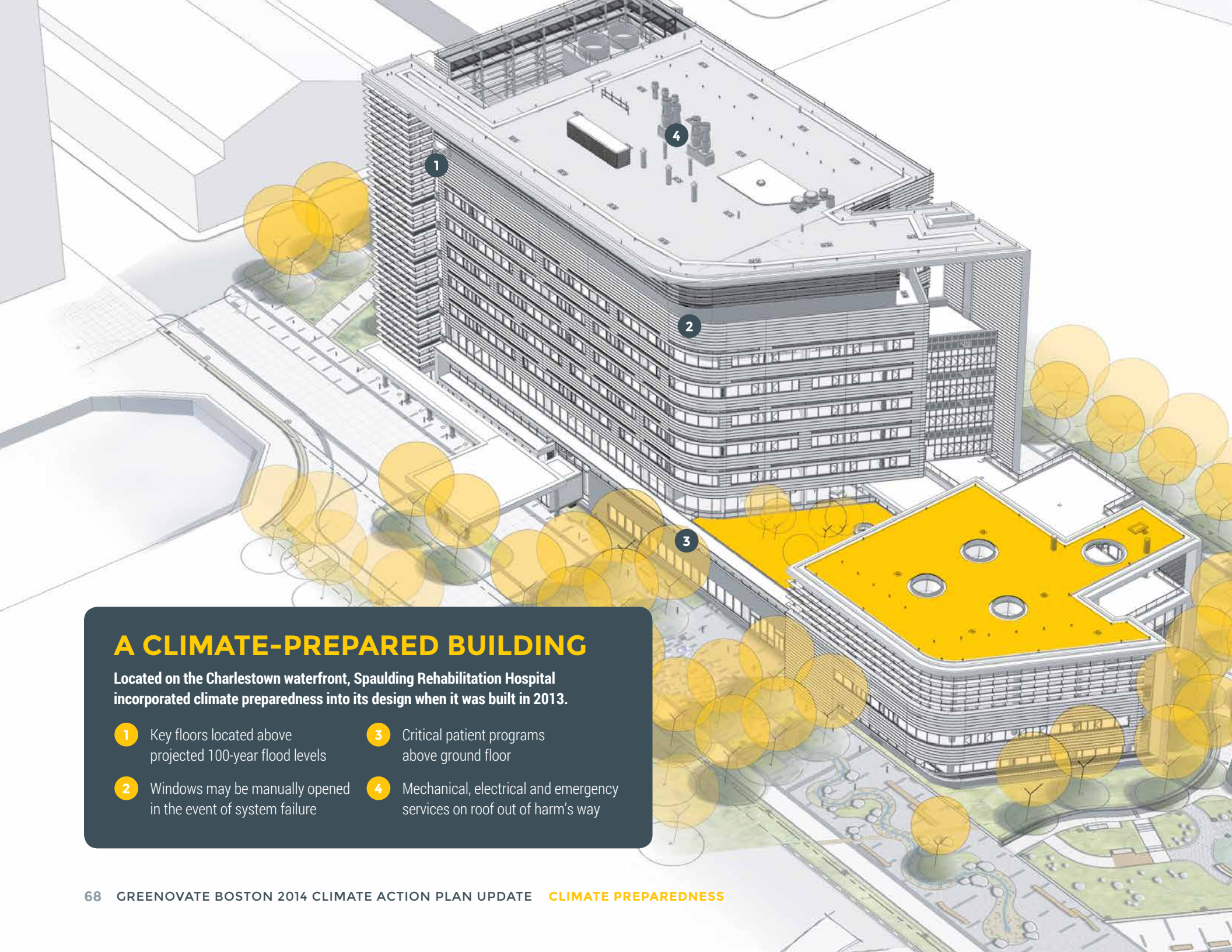


##### 4.12 Expand and align outreach to residents

Include climate preparedness as a consideration in Renew Boston's energy programs and its outreach activities.



Former Mayor Thomas Menino announces a new residential solar assistance program in 2011.








## A CLIMATE-PREPARED BUILDING

Located on the Charlestown waterfront, Spaulding Rehabilitation Hospital incorporated climate preparedness into its design when it was built in 2013.

- 1 Key floors located above projected 100-year flood levels
- 2 Windows may be manually opened in the event of system failure
- 3 Critical patient programs above ground floor
- 4 Mechanical, electrical and emergency services on roof out of harm's way

**FIGURE 19: COORDINATING CLIMATE PREPAREDNESS EFFORTS**

	 <b>BUILDINGS</b>	 <b>TRANSPORTATION</b>	 <b>LAND USE &amp; NATURAL SYSTEMS</b>	 <b>ENERGY</b>	 <b>WATER INFRASTRUCTURE</b>	 <b>EMERGENCY MANAGEMENT</b>
<b>CITY</b>	Building permits and inspections Zoning Energy reporting requirements	Local roads and sidewalks Complete Streets design guidelines Parking	City parks and urban wilds Street trees Open space planning Wetlands protection Floodplain regulation	Permits infrastructure developments Develops district energy, energy efficiency programs	Retail water distribution, waste water and storm water collection (BWSC) Groundwater overlay district (zoning)	Local emergency response Public safety Emergency shelters and cooling centers
<b>STATE</b>	Building code Insurance regulation	MBTA system State highways and parkways Airport and seaport	DCR Parkland (Muddy River; Charles River) Dams; Access to waterfront	Energy utility regulation Energy efficiency and renewable energy incentives	Wholesale water supply and waste water treatment (MWRA, Deer Island)	Regional emergency response (backup for cities)
<b>FEDERAL</b>	Flood insurance	Airport and railroad Federal highway standards Coast Guard regulations	Boston Harbor Islands National Recreation Area Designation of floodplain	Regional electricity grid (transmission) Power plant regulation Energy efficiency and renewable energy incentives	Clean Water Act	Federal emergency response (backup for states)