# LEGAL OPTIONS FOR MUNICIPAL CLIMATE ADAPTATION IN SOUTH BOSTON


Harvard Law School
**Emmett Environmental Law & Policy Clinic**

Prepared by
Wendy B. Jacobs, *Esq., Director*
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Comments are welcome and may be directed to Wendy B. Jacobs at wjacobs@law.harvard.edu.

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**The Emmett Environmental Law & Policy Clinic** at Harvard Law School is directed by Wendy B. Jacobs and is dedicated to addressing major environmental issues in the United States and abroad and to providing its students an opportunity to do meaningful, hands-on environmental legal and policy work. Students and clinic staff work on issues such as climate change, pollution reduction, water protection and smart growth.



Cover Image: Aerial view of South Boston. Source Boston Redevelopment Authority

# TABLE OF CONTENTS

# EXECUTIVE SUMMARY

The City of Boston has been taking action to mitigate climate change for over a decade. In 2000, at the direction of Mayor Menino, Boston joined the Cities for Climate Protection Campaign of ICLEI – Local Governments for Sustainability. Since that time, the City has pursued a number of programs to increase energy efficiency and reduce greenhouse gas emissions.[1]

More recently, the City has also recognized the need to prepare for and adapt to the effects of climate change (known as climate change adaptation).[2] In March 2009, Mayor Menino established the Boston Climate Action Leadership Committee and Community Advisory Committee (the "Committees"). The Committees were charged, in part, with evaluating the risks from sea level rise and other consequences of climate change and recommending actions for the City and its residents to take to reduce these risks. The Committees issued their final report, entitled *Sparking Boston's Climate Revolution*, in April 2010.[3] The City has recently reported on its work on those recommendations in its 2011 *Climate Action Plan Update, a Climate of Progress*.[4]

Harvard Law School's Emmett Environmental Law & Policy Clinic and its students (collectively, the "Clinic") are assisting the City with its ongoing efforts to adapt to the impacts of climate change by analyzing the City's legal authority and identifying opportunities for addressing its climate vulnerabilities. In particular, this paper focuses on identifying solutions to the impacts of sea level rise and more frequent and more intense storms in Fort Point Channel and South Boston. The goal of this work is to provide the City with an understanding of the legal options available to address climate change adaptation rather than recommend a specific list of adaptation measures.

## (1) The Impacts of Climate Change on Boston

Climate change is already occurring in the Boston metropolitan region and is projected to produce increasingly serious consequences over the course of this century. The magnitude of these impacts

1 Sparking Boston's Climate Revolution: Recommendations of the Climate Action Leadership Committee and Community Advisory Committee 12 (2010) [hereinafter "Sparking Boston's Climate Revolution"], *available* at http://www.cityofboston.gov/Images_Documents/BCA-full_rprt_r5_tcm3-19958.pdf (last visited August 17, 2011).

2 Climate adaptation refers to efforts to prepare for or "adapt" to current and future changes in climate.

3 Sparking Boston's Climate Revolution, *supra* note 1.

4 A Climate of Progress, City of Boston Climate Action Plan Update 2011 (April 2011), *available at* http://www.cityofboston.gov/Images_Documents/A%20Climate%20of%20Progress%20-%20CAP%20Update%202011_tcm3-25020.pdf (last visited June 23, 2011).

will depend on the climate change mitigation measures adopted around the world. Even with aggressive cuts in greenhouse gas emissions, however, some changes in Boston's environment are inevitable.

Climate change is expected to cause approximately two and a half to five feet of sea level rise in Boston Harbor by the end of the century.[5] This will lead to saltwater intrusion and inundation of many low-lying areas and coastal resources that currently provide flood protection. More frequent and more intense storms are likely to compound the problems caused by sea level rise and lead to greater coastal flooding and erosion.[6]

These changes are expected to affect many aspects of Boston's residential, commercial, and industrial development as well as its transportation, water, waste, and communications infrastructure. For example, large portions of the City are located on filled lands situated at low elevations and are vulnerable to sea level rise and to flooding from storm events. Similarly, the increase in stormwater runoff resulting from increased precipitation could raise pollution levels in coastal waters, affecting opportunities for public recreation at beaches and on waterways. Climate-related changes are also expected to impact public health. Water pollution will increase exposure to carcinogens and E. coli bacteria, and saturated buildings will increase exposures to mold, bacteria, and allergens.[7]

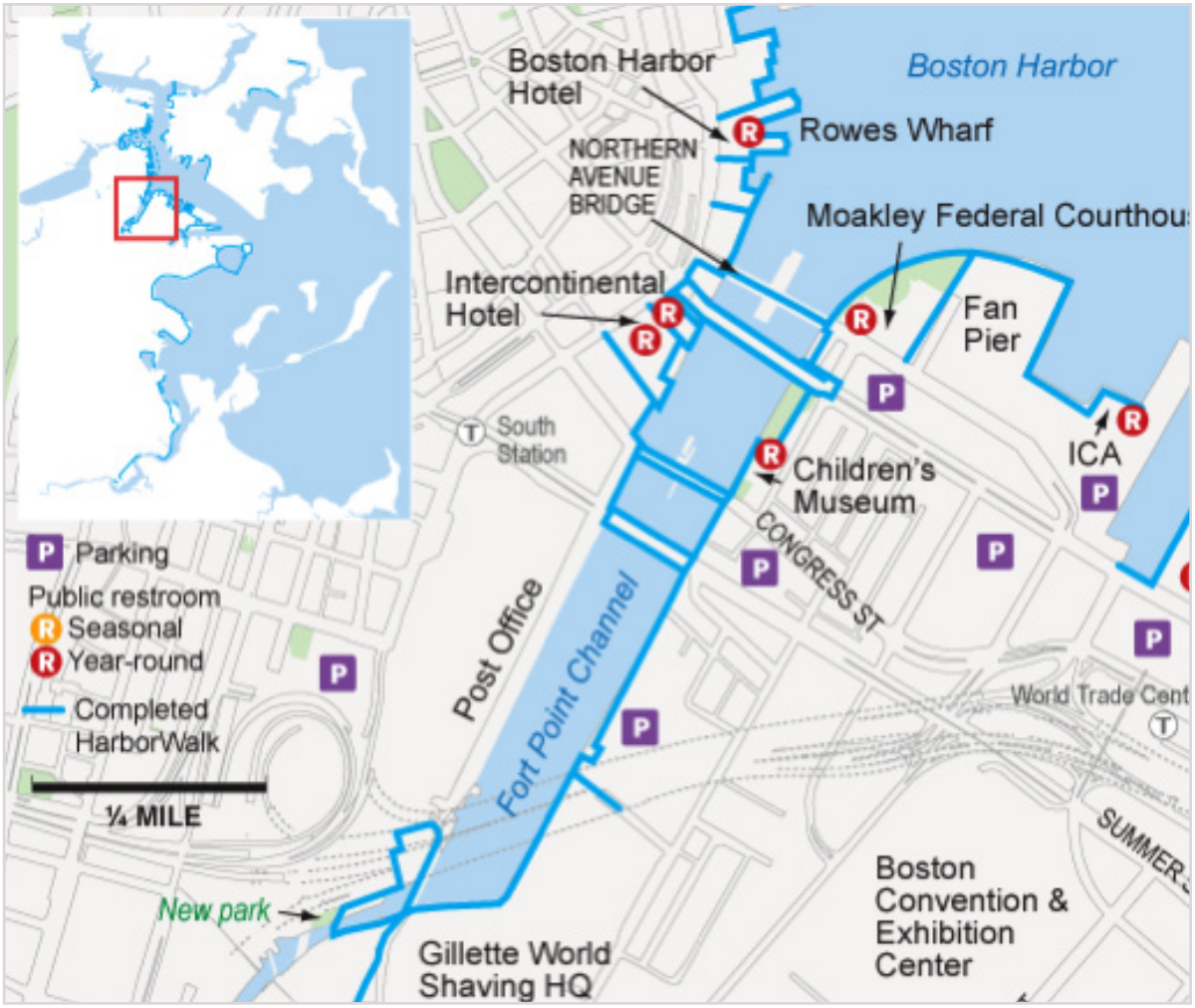
South Boston, and the Fort Point Channel area in particular, was filled in the early 1800s and functioned as a center for industrial employment starting in the 1880s.[8] Today, South Boston includes residential, commercial, and industrial properties; a historic district, new buildings and areas of planned development; private and government-owned properties; and important transportation, wetlands, and water-system infrastructure. South Boston is undergoing substantial redevelopment and the Fort Point Channel District is expected to function as a connection between the Seaport and the Downtown Financial District. Given ongoing and planned redevelopment projects in

5 *See* Ellen Douglas and Chris Watson, Boston Harbor Sea Level Rise Mapping at the Boston Harbor Sea Level Rise Forum (Nov. 9-10, 2010). Two and a half and five feet of sea level rise represent two different low- and high-range scenarios of sea level rise by 2100. However, the plausible range of sea level rise for the Boston Harbor may be greater.

6 Union of Concerned Scientists, Confronting Climate Change in the U.S. Northeast: Massachusetts 2-3 (2007), *available at* http://www.climatechoices.org/assets/documents/climatechoices/massachuetts_necia.pdf (last visited June 22, 2011).

7 *See, e.g.*, Phoebe Chang, The Effects of Coastal Storms, Sea Level Rise and Basement Flooding in East Boston (2010) (unpublished paper, on file with the Harvard Emmett Environmental Law & Policy Clinic).

8 Boston Redevelopment Authority, The Fort Point District 100 Acres Master Plan 13 (Sept. 2006) [hereinafter 100 Acres Master Plan], available at http://www.bostonredevelopmentauthority.org/planning/PlanningInitsIndividual.asp?InitID=33&action=ViewInit (last visited June 22, 2011).




MAP 1: Fort Point Channel. Source: Boston Redevelopment Authority

South Boston, as well as that area's vulnerability to the impacts of climate change, there is a present opportunity to make changes in a climate-smart way.

The City will need to capitalize on existing regulations, develop new regulatory tools and other strategies to adapt to climate change, and identify resources for accomplishing these goals. For example, Boston will need to integrate climate adaptation into its ongoing, daily decision-making processes regarding new development and public investment. It will need to improve stormwater management by reducing stormwater runoff and combined sewer overflows; ensure that new development and critical infrastructure are built to withstand the expected impacts of climate change and that existing development, infrastructure, and public amenities are maintained and protected; and support those residents most vulnerable to the impacts of climate change, such as low-income, minority, and elderly populations, in dealing with these effects.

## (2) Methodology and Organization of the Paper

We developed the options presented in this paper by reviewing experiences with climate adaptation in other cities both domestically and internationally, combing relevant literature, and responding to the City's input regarding its adaptation priorities. We then analyzed relevant legislation, regulations, and case law to identify the City's legal authority to utilize identified options.

This paper is organized into four different categories of options available to the City for reducing its vulnerability to the impacts of sea level rise and flooding. These include:

» Project and environmental reviews;

» Legislation and regulations;

» Public investment; and

» Funding for specific adaptation measures.

For each category the paper presents specific options that lay out the legal authority for the option, the type of development to which the option applies, and a description of how the option could be utilized. Recognizing the extraordinary effort and resources required to implement legislative and regulatory changes, the options within each category are prioritized based on the extent of modification necessary. Each category begins with options for which there is existing legal authority and concludes with options requiring expanded or new authority. Table 1 provides an overview of each option and a description of recommended actions for utilizing each option.

## TABLE 1: Overview of Options & Recommended Actions

| | |
|---|---|
| **1. Project and Environmental Reviews** | |
| A. Project Impact Review | The City can consider the impacts of climate change on projects, and vice versa, through Article 80 of the Zoning Code. |
| B. Environmental Impact Review | The City can include adaptation considerations in its comments on the scoping and environmental review of projects under the Massachusetts Environmental Protection Act ("MEPA").<br><br>The City can work with the state MEPA Office to ensure that MEPA's guidance for considering the impacts of climate change in environmental review is consistent with the City's approach. |
| **2. Legislation & Regulations** | |
| A. Code Enforcement | The Boston Commissioner of Inspectional Services has existing authority to abate nuisances that are injurious to the public health, including those caused by unsafe buildings, and to require that existing buildings meet current flood-resistance standards in certain circumstances under the State Sanitary and Building Codes.<br><br>The City's Public Health Commission and the Commissioner of Inspectional Services can pass regulations that build on the minimums set forth in the state sanitary code and the State Board of Building Regulations and Standards ("BBRS") can broaden the situations in which flood-resistance standards apply to existing buildings.<br><br>The City can establish a committee comprised of relevant Departments to prioritize code enforcement efforts and establish guidelines for implementation. |
| B. Chapter 91 Licenses | The City can consider sea level rise during new Chapter 91 licensing proceedings.<br><br>The City can request that the Massachusetts Department of Environmental Protection ("DEP") use its authority to renew, amend, revoke, or nullify licenses to ensure continuing compliance with public access requirements. |
| C. Overlay Zones | The City can amend its Groundwater Conservation Overlay Zone to improve stormwater management and increase onsite retention. |
| D. Wetlands Ordinance | The City can enact a wetlands ordinance to improve stormwater management and protect coastal resources. |
| E. Floodplain Regulations | The City can use maps identifying the future 100-year floodplain as a basis for delineating Flood Hazard Districts under Article 25 of the Boston Zoning Code.<br><br>The City can also restrict vulnerable ground floor uses within these Districts. |

| | |
|---|---|
| F. Resilient Building Design | The City can adopt flood-related performance standards in Article 80 of the Boston Zoning Code, similar to its approach to green building.<br><br>The City can request that the BBRS pass more stringent flood-resistance standards for Boston or create a flood-resistance stretch code that Boston and other municipalities could adopt. |
| **3. Public Investment** | |
| A. Procurement | The City can use its procurement policies to mandate use of materials that will aid adaptation, such as use of flood-resistant materials in public buildings subject to future flooding. |
| B. Capital Planning | The City can use its capital planning process to identify and prioritize investments to maintain, renovate, and upgrade public infrastructure to reduce vulnerability to the impacts of climate change. |
| C. Regional Cooperation | The Boston Water and Sewer Commission ("BWSC") can develop a rate system to charge other municipalities for inflows to the City, work with other municipalities to reduce inflows to Boston, and/or co-finance stormwater management projects in other municipalities to increase Boston's reserve capacity and reduce combined sewer overflows ("CSOs").<br><br>The City can encourage the Massachusetts Water Resources Authority ("MWRA") to improve Boston's stormwater flow through its capital improvement program. |
| **4. Funding for Specific Adaptation Measures** | |
| A. FEMA Funding for Hazard Mitigation | The City can use Federal Emergency Management Agency ("FEMA") Hazard Mitigation Grant Program planning funds to assess its vulnerability to climate change-related hazards as part of its Hazard Mitigation Plan update.<br><br>The City can use this plan to access further federal grant funding to reduce its vulnerability to climate change-related natural hazards. |
| B. Community Development Block Grant (CDBG) Funding | The City can utilize Community Development Block Grants to fund projects that help reduce vulnerability to climate change in low-income neighborhoods. |
| C. BWSC User Fees | The BWSC can co-finance maintenance of green infrastructure with the City through its user fees. |

Table 2 sets out the legal authority and type of development that could be affected for each recommended action described above. A glossary of relevant terms is included below.

### TABLE 2: Overview of Legal Authority

| | Legal Authority | | | Type of Development | |
|---|---|---|---|---|---|
| | Existing | Expanded | New | New and Substantial Redevelopment | Existing Development |
| **1. Project and Environmental Reviews** | | | | | |
| A. Project Impact Review | X | | | X | |
| B. Environmental Impact Review | X | | | X | |
| **2. Legislation & Regulations** | | | | | |
| A. Code Enforcement | X | | | X | X |
| B. Chapter 91 Licenses | X | | | X | X |
| C. Overlay Zones | | X | | X | |
| D. Wetlands Ordinance | | X | | X | X |
| E. Floodplain Regulations | | X | | X | |
| F. Resilient Building Design | | X | X | X | X |
| **3. Public Investment** | | | | | |
| A. Procurement | X | | | X | X |
| B. Capital Planning | X | | | X | X |
| C. Regional Cooperation: BWSC Joint Projects | X | | | n/a | |
| **4. Funding for specific adaptation measures** | | | | | |
| A. FEMA Funding for Hazard Mitigation | X | | | n/a | |
| B. Community Development Block Grant (CDBG) Funding | X | | | | |
| C. BWSC User Fees | X | | | | |

### Glossary of Terms:

1. **Existing authority** is defined as legal authority that the City and/or the state have under current law and may include minor policy changes such as the revision of municipal guidance or the issuance of an executive order.

2. **Expanded authority** is defined as legal authority that the City has under current state law, but requires amendment of existing municipal legislation or regulation or creation of new

municipal legislation.

**3. New authority** is defined as legal authority that the City does not have under current law and would require legislative or regulatory amendment at the state level to provide.

### (3) Challenges and Next Steps

We confronted several challenges in developing the list of options presented here. First, the absence of methods for measuring the (avoided) costs and benefits of different options made it difficult to prioritize potential options or to highlight the tradeoffs between different adaptation measures. Second, many of the adaptation measures proposed for other communities are designed for small communities that are making decisions about the location and character of their future (green-fields) development. As a result, the range of policy options focuses overwhelmingly on measures for improving the resilience of new development, rather than for addressing existing development. These options are less useful to a large, developed city like Boston, which is challenged to adapt a substantial amount of existing development to the future impacts of climate change. Boston has an opportunity to be a pioneer in this area. While many of the options discussed in this paper are being discussed elsewhere, few large cities have implemented significant adaptation measures. Boston can, therefore, be a leader in the U.S. and internationally as it moves forward with proactive implementation of adaptation measures.

# 1. PROJECT AND ENVIRONMENTAL REVIEWS

## A. Project Impact Review

**Legal authority:** existing municipal authority

**Type of development**: new development and substantial redevelopment

**Option:** The City can consider the impacts of climate change on projects and vice versa through Article 80 of the Zoning Code.

Article 80 of the Zoning Code requires the Boston Redevelopment Authority ("BRA") to review the effect of the design of any proposed development on the surrounding community, including its impacts on the environment and tidelands.[9] Article 80 does not explicitly require consideration of sea level rise or other climate-related impacts. Such consideration, however, is beginning to occur for certain projects. For example, the financial group Morgan Stanley Boston Seaport considered the impacts of sea level rise for the Seaport Square project in its Draft Project Impact Report, and as a result, decided to raise the base of the building three feet above the current Federal Emergency Management Agency ("FEMA") 100-year floodplain (otherwise known as the base flood elevation).[10] Similarly, the Spaulding Rehabilitation Hospital, which recently relocated to the Charlestown Navy Yard, gave considerable weight to projections of sea level rise in its design decisions.[11] Spaulding's design team modeled various elevations for the building based on sea level rise projected to occur by 2085, which assumed a 75-year life for the building.[12] It then conducted cost-benefit analyses of the different options based on the likelihood of various sea level rise scenarios.[13] As a result, Spaulding decided to raise the hospital two and a half feet above the current 500-year floodplain.[14] In addition, Spaulding put the generators, safe rooms, and backup systems on top of the building and made sure that the windows could be opened to ensure that patients have access to fresh air in an emergency.[15]

9 Boston Redevelopment Authority, A Citizen's Guide to Development Review Under Article 80 at 5, 7 (2004).

10 MS Boston Seaport, Draft Project Impact Report, Part 9.0 Response to Comments, BED.12

11 Hubert Murray, Presentation on Spaulding Rehabilitation Center at the Boston Harbor Sea Level Rise Forum (Nov. 9-10, 2010).

12 *Id.*

13 *Id.*

14 *Id.* However, a member of the design team noted that even this will not be enough to handle the most extreme projected impacts in fifty years.

15 *Id.*

These examples provide important lessons and experiences for identifying how climate impacts, including sea level rise, can be considered in the municipal decision-making process. However, comprehensive and consistent consideration is important to ensure that the full range of climate impacts, including heat waves, is taken into account. The fact that Article 80 review already accounts for environmental impacts and impacts on tidelands provides substantial authority for the City to address climate change impacts in its Article 80 reviews.[16]

### B. Environmental Impact Review

**Legal authority:** existing municipal and state authority

**Type of development:** new development and substantial redevelopment

**Options:**

- The City can include adaptation considerations in its comments on the scoping and environmental review of projects under the Massachusetts Environmental Protection Act ("MEPA").
- The City can work with the state MEPA Office to ensure that guidance for considering the impacts of climate change in environmental review under MEPA is consistent with the City's approach.

In 2008, Massachusetts passed the Global Warming Solutions Act, which amended MEPA to mandate that all agencies and departments analyze the impacts of climate change, such as predicted sea level rise, during the consideration of licenses, permits, and other administrative decisions.[17] MEPA regulations define "agency" broadly to include "any agency, department, board, commission, or authority of the Commonwealth" including municipal redevelopment agencies.[18] As a result, state-level environmental reviews conducted in connection with licensing and permitting of certain projects in the Fort Point Channel and South Boston Waterfront area will now include consideration of climate change impacts.

Not all projects will trigger MEPA, as MEPA only requires environmental review if projects meet established thresholds.[19] The thresholds triggering environmental review that may be relevant to the Fort Point Channel/South Boston waterfront area are:

16 Our research has identified no case law regarding the City's authority to consider climate change issues pursuant to Article 80 of the Zoning Code.

17 M.G.L. c. 30, § 61.

18 301 CMR 11.02.

19 301 CMR 11.03.

- the creation of ten or more acres of impervious area (301 CMR 11.03(1)(a)(2));
- approval in accordance with M.G.L. c. 121A of a new urban redevelopment project or a fundamental change in an approved urban redevelopment project, provided that the project consists of 100 or more dwelling units or 50,000 or more square feet of non-residential space (301 CMR 1.03(1)(b)(6));
- an alteration requiring a variance in accordance with the Wetlands Protection Act (301 CMR 11.03(3)(a)(2));
- for projects requiring a Chapter 91 license, new non-water dependent use or expansion of an existing non-water dependent structure, provided the use or structure occupies one or more acres of waterways or tidelands (301 CMR 11.03(3)(a)(5));
- new fill or structure or expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway (301 CMR 11.03(3)(b)(1)(e));
- alteration of one half or more acres of any other wetlands (301 CMR 11.03(3)(b)(1)(f));
- construction, reconstruction or expansion of an existing solid fill structure of 1,000 or more square feet of base area or of a pile-supported or bottom-anchored structure of 2,000 or more square feet of base area, except a seasonal, pile-held, or bottom-anchored float, provided the structure occupies flowed tidelands or other waterways (301 CMR 11.03(3)(b)(6)).

### (a) Agency Comments

As part of its agency review, the Environment Department could routinely submit comments to the Secretary of Energy and Environmental Affairs (the "Secretary") requesting that the impacts of climate change be considered in the environmental review of proposed projects such as the Seaport Square and Spaulding Rehabilitation Projects discussed above.

### (b) Guidance

As yet, no regulations or guidance have been developed to guide consideration of climate change impacts.[20] Without guidance, it is difficult for state and local agencies to know how to implement this provision, given its complicated nature as well as lack of consensus surrounding projections of climate change impacts. The State Adaptation Advisory Committee's forthcoming report is expected to include a section on this issue, and the state MEPA Office hopes to develop guidance soon after the report is issued.[21] The City could work with the state MEPA Office to ensure that guidance is consistent with the City's approach to considering climate change impacts.

20 Massachusetts Environmental Policy Act, M.G.L. c. 30 §§ 61-62H, *available at* http://www.env.state.ma.us/mepa/ (last visited June 22, 2011).

21 Telephone interview with Alicia McDevitt, Director, MEPA Office (Sept. 14, 2010).

# 2. LEGISLATION AND REGULATIONS

## A. Code Enforcement

**Legal Authority:** existing municipal authority

**Type of Development:** new development and substantial redevelopment; existing development

**Options:**

- The Boston Commissioner of Inspectional Services already has the power to abate nuisances that are injurious to the public health, including those caused by unsafe buildings, and to require that existing buildings meet current flood-resistance standards in certain circumstances under the State Sanitary and Building Codes.
- The City's Public Health Commission and the Commissioner of Inspectional Services can pass regulations that build on the minimums set forth in the State Sanitary Code and the State Board of Building Regulations and Standards ("BBRS") can broaden the situations.
- The City can establish a committee comprised of relevant Departments to prioritize code enforcement efforts and establish guidelines for implementation.

Extreme storms and consistent flooding can damage property in ways that are detrimental to the public health and safety. Flooding can lead to structural damage, as well as the growth of mold, bacteria, and allergens.[22] The City can ensure that buildings remain structurally safe and maintain a sufficient level of indoor environmental quality despite damage from flooding and sea level rise through enforcement of the State Sanitary and Building Codes. While the current Codes will enable the City to deal with many of these problems, acting now to expand and clarify the City's authority to combat public health and safety risks that may arise due to climate change will be important to implementation in the future. The City could also establish a committee to coordinate and prioritize scarce resources and develop guidelines for consistent implementation of code enforcement efforts.

22 Chang, *supra* note 7.

### (a) State Sanitary Code

#### 1. Existing Nuisance Abatement and Removal Authority

Enforcement of the State Sanitary Code will ensure that buildings remain safe despite flooding and sea level rise. The state public health law grants the Public Health Commission and the Commissioner of Inspectional Services the power to abate nuisances "which may … be injurious to the public health."[23] This includes authority to order property owners to abate nuisances, and where the owner fails to do so, to remove the nuisance and assess the costs to the private owner or occupant.[24] The Commissioner of Inspectional Services, through his Housing Division, exercises this authority with regard to residential buildings, and the Public Health Commission can exercise this authority with regard to all other buildings.[25]

A separate provision of the State Public Health Law gives the Housing Division authority to order the owner to bring the residential building into compliance and the occupants to vacate if a residence is unfit for human habitation.[26] Regulations promulgated under this provision comprise the State Housing Code (part II of the State Sanitary Code) and identify specific circumstances in which residential buildings are unfit for human habitation or may cause a nuisance. Several provisions encompass damage related to climate change. For example, owners of residential property are required to ensure that a dwelling "excludes wind, rain and snow, and is rodent-proof, watertight and free from chronic dampness, weathertight."[27] Chronic dampness is defined as "the regular

23 M.G.L c. 111, § 122 (granting power to Board of Health); Boston Mun. Code 9-1.2. (establishing that the commission of Housing Inspection can exercise powers conferred on Boards of Health); Boston Mun. Code 9-9.7 (abolishing the Housing Inspection Department and transferring all "powers, duties and appropriations" of the Housing Inspection Department to the Inspectional Services Department).

24 M.G.L c. 111, §§ 122-125 (Thomson 2011). Most of the relevant case law has recognized this authority where the nuisance had clear public health implications. *See, e.g.*, *Tracht v. County Comm'rs of Worcester*, 63 N.E.2d 561, 563 (Mass. 1945) (legitimate for a board of health to issue abatement order regarding keeping of chickens in building); *Malden v. Flynn*, 61 N.E.2d 107 (Mass. 1945) (discussing authority of the boards of health to abate nuisances relating to garbage). Recent case law has indicated an expansive conception of public health. *United Comb & Novelty Corp. v. City of Leominster Bd. of Health*, 17 Mass. L. Rep. 233 (Mass. Super. Ct. 2004) (upholding an abatement order involving noise and light pollution from trucks entering a warehouse that disturbed local neighbors). This recent decision suggests that Courts will recognize abatement orders issued to remove public health nuisances that arise from climate change impacts as a proper exercise of the Commissioner's authority.

25 *See* M.G.L. c. 111 App., § 2-6(b); Boston Mun. Code 9-1.2 and 9-9.7.

26 M.G.L. c. 111, § 127B.

27 105 CMR 410.500 (Thomson 2011); *see also*, 105 CMR 410.501(C) ("A wall, floor, ceiling or other structural element shall be considered weathertight only if all cracks and spaces not part of heating, ventilating or air conditioning systems are caulked or filled in as to prevent infiltration of exterior air or moisture").

and/or periodic appearance of moisture, water, mold or fungi."[28] The regulations also contain a list of conditions deemed to endanger or impair health and safety, which includes: "Roof, foundation, or other structural defects that may expose the occupant or anyone else to fire, burns, shock, accident or other dangers or impairment to health or safety"[29] and which could be construed to include dangers posed by flooding or storms.

Where a residential building fails to comply with the State Sanitary Code in a manner which "endanger[s] or materially impair[s] the health or [safety and well-being of the occupants or the public],"[30] the Commissioner of Inspectional Services or the Public Health Commission may provide for the "demolition, removal, repair or cleaning" of such building.[31] In the context of climate change, this provision will enable the City to secure buildings that are out of compliance or have been abandoned as a result of sea level rise or extreme flooding.[32]

### 2. Authority to Pass Additional Regulations

The Commissioner of Inspectional Services and the Public Health Commission may also pass additional regulations to expand and clarify the City's authority to combat public health and safety risks that may arise due to climate change. The State Sanitary Code sets a regulatory floor on which the Commissioner of Inspectional Services may build with respect to residential buildings, so long as the regulations relate to public health and do not conflict with state law.[33] To date, it does not appear that this authority has been utilized.

28 105 CMR 410.020.

29 105 CMR 410.750(K).

30 105 CMR 410.750.

31 M.G.L. c. 111, § 127A.

32 The City Council has adopted additional ordinances that require the periodic inspection of buildings, which could facilitate the discovery of climate change related damage. *See* Boston Mun. Code 9-1.3 (requiring the inspection of rental units between tenants); and 9-9.12 (requiring the inspection of exterior walls of high rise structures and large unoccupied, commercial buildings).

33 M.G.L. c. 111, § 127A (The state sanitary code "shall not be deemed to limit the right of any board of health to adopt such rules and regulations as, in its opinion, may be necessary for the particular locality under its jurisdiction; provided, such rules and regulations do not conflict with the laws of the commonwealth or the provisions of the code."); *see also* 105 CMR 400.015 ("[U]nless otherwise expressly provided in any other article, the legally designated health authority of any city ... may, as it considers necessary to promote and protect the health and well being of the particular locality under its jurisdiction, adopt under its own legal power as exists in the General Laws any rules or regulations containing requirements stricter than those contained in the State Sanitary Code."); *United Reis Homes, Inc. v. Planning Bd. of Natick*, 270 N.E.2d 402, 404 (Mass. 1971) (citing both section 31 and section 122 for the proposition that "[b]oards of health have plenary power to make reasonable health regulations and to remove or prevent nuisances, sources of filth and causes of sickness").

Although the current State Sanitary Code encompasses climate-related health risks, as described above, there are several ways in which the Commissioner of Inspectional Services can take proactive steps to make the Code stronger and more explicit for conditions that may arise from climate change. The Commissioner could add, or specify in more detail, conditions to the standards of fitness for human habitation and conditions deemed to endanger or impair health or safety. The Commissioner could add requirements that specific actions be taken following flooding or storms in preparation for climate change, based on his authority to abate conditions that "may become a nuisance."[34] Finally, the Commissioner could increase the frequency of inspections of the exterior walls of occupied buildings that are located in areas subject to frequent flooding or sea level rise.

The Public Health Commission could impose similar requirements on non-residential buildings. The Public Health Commission has broad authority to "make reasonable health regulations," so long as there is a public health nexus and the regulations do not conflict with state law.[35] This authority includes the power to regulate private locations,[36] even if the regulations implicate land-use considerations.[37] The Public Health Commission could therefore pass regulations involving building design if there is a "solid connection" between the purported land use and the health related issue.

### (b) State Building Code

#### 1. Existing Abatement and Removal Authority

The City can also ensure that buildings damaged from flooding and sea level rise remain structurally safe through enforcement of the State Building Code. State law, under Chapter 143 and the State Building Code, also grants the City the authority to abate nuisances posed by unsafe structures including those damaged by sea level rise, coastal storms, and flooding.[38] The Building and Services Division of the Inspectional Services Department (the "Division") is required to inspect any structure that "is dangerous to life or limb" or "is unused, uninhabited or abandoned, and open

34 M.G.L. c. 111, §§ 127A-127B.

35 M.G.L. c. 111, § 31. Massachusetts courts have "long recognized that the rule making authority of local boards of health is broad" under this section. *Am. Lithuanian Naturalization Club v. Bd. of Health of Athol*, 844 N.E.2d 231, 238 (Mass. 2006). Regulations promulgated pursuant to this section have "a strong presumption of validity" and will only be overturned if a plaintiff proves that the regulation "cannot be supported upon any rational basis of fact that reasonably can be conceived to sustain it." *Id.*

36 The Supreme Judicial Court has remarked that nothing "warrants a conclusion that members of a community may be protected by health regulations only when they are in a location to which the public has access." *Am. Lithuanian Naturalization Club*, 844 N.E.2d at 238.

37 *Hamel v. Bd. of Health of Edgartown*, 664 N.E.2d 1199, 1201 (Mass. App. Ct. 1996) ("[T]he regulations that a board of health adopts under G. L. c. 111, § 31, may deal with land use if there is a solid connection between the use and a health related issue.").

38 *See* M.G.L. c. 143, §§ 6-10; 780 CMR 121.0.

to the weather" as soon as it becomes aware of the condition.[39] Where a structure is found to be unsafe, the Division may order the owner to make the structure safe or to remove it.[40] Should an owner fail to comply with the order of abatement or removal, the Division has the power to remove the nuisance and assess all costs of securing or removing the structure to the property owner.[41] Neither the State Building Code nor existing case law defines "unsafe structures," or clarifies what constitutes a structure that is "dangerous to life or limb."[42] The Building Code, however, separately requires that "[a]ll buildings and structures … both existing and new, and all systems and equipment therein … shall be maintained in a safe, operable and sanitary condition."[43] This authority should suffice to abate nuisances caused by damage from sea level rise or coastal flooding, which result in lack of compliance with the State Building or Sanitary Codes.

The Division may also require existing buildings to comply with standards for Flood Resistant Construction under the Building Code where renovations or repairs meet specified thresholds.[44] All buildings located in the FEMA 100-year floodplain must comply with flood-resistance requirements, where the work involves substantial repair of a foundation,[45] repair or replacement of a foundation,[46] and/or a substantial improvement.[47] Buildings in High Hazard Zones, or V-Zones, must also comply with flood-resistance requirements where the work involves a lateral addition.[48]

39 M.G.L. c. 143, § 6; 780 CMR 121.2.

40 *See id.*

41 *See* M.G.L. c. 143, § 9; 780 CMR 121.5. Parties aggrieved by local action or inaction may appeal to the State Building Code Appeals Board, although a stay of proceedings during an appeal does not affect local authority to remove the unsafe building. *See* M.G.L. c. 143, § 10; 780 CMR 121.6.

42 M.G.L. c. 143, § 6.

43 780 CMR 103.1.

44 *See* 780 CMR 120.G201, 120.G501.10, 120.G601.9.

45 "Substantial repair of a foundation" is defined as repairs that equal or exceed "50% of the perimeter of the entire foundation measured in linear feet" or a building "that has incurred a failure of the foundation regardless of the actual work done to replace the foundation." 780 CMR 120.G201.

46 "Repair or replacement of a foundation" is defined as a substantial repair, replacement of the foundation "so as to constitute new construction," or replacement of the "foundation in total. 780 CMR 120.G501.6 and 120. G601.5.

47 *See* 780 CMR 120.G501.10, 120.G601.9. "Substantial improvements" include "any reconstruction, rehabilitation, addition, repair or improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the 'start of construction' of the improvement." 780 CMR 120.G201. Also note that in an A-Zone, where the substantial improvement consists only of a "lateral addition that does not rely on the support of the existing structure" only the lateral addition must be constructed to comply with the flood-resistance requirements of 780 CMR 120.G501. *See* 780 CMR 120.G501.1.

48 "Lateral addition" is defined as "an addition that expands the footprint of a building or structure." 780 CMR 120. G201.

### 2. Expanded Authority

The City could request that the BBRS broaden the set of circumstances in which existing buildings must comply with the standards for Flood Resistant Construction under the State Building Code. The City is precluded from making changes to the State Building Code[49] and from regulating issues addressed by the Building Code under its Zoning Code.[50] It therefore lacks the authority to modify the thresholds for when flood-resistance requirements apply to existing development. However, it may appeal to the BBRS to broaden the set of circumstances in which existing buildings must comply with flood resistance requirements.[51]

## (c) Coordinating Implementation of Code Enforcement

The City could establish a committee comprised of relevant departments to coordinate and prioritize efforts to implement code enforcement. This could include the development of guidelines for enforcement of State Sanitary and Building Codes, prioritization of scarce resources for implementation of code enforcement, and identification of new mechanisms to fund these efforts. Finally, the committee could also consider options for inventorying buildings damaged from sea level rise and flooding, similar to the City's recent approach to foreclosed properties.[52]

49 State law provides that "the state building code shall be the code for *all buildings and structures*" and that in any conflict with local zoning bylaws, the State Building Code shall control. M.G.L. c. 143, § 3A. (emphasis added).

50 In *Enos v. City of Brockton*, 236 N.E.2d 919 (Mass. 1968), the Supreme Judicial Court stated the distinction between zoning and building regulation as follows: "Whereas the main purpose of zoning is to stabilize the use of property and to protect an area from deleterious uses, a building code relates to the safety and structure of buildings." *Id.* at 921. In that case, the court struck down a zoning ordinance provision that mandated the use of a certain type of wall and floor in the construction of dwellings. The court held that was a matter "properly the subject of building codes rather than zoning regulations." *Id.* The court found that the language of the Massachusetts Zoning Enabling Act providing that "a zoning ordinance may regulate and restrict the erection, construction, reconstruction, alteration or use of buildings, or use of land" and identifying a public purpose to "secure safety from fire" did not authorize the regulation and inspection of building materials. *Id.* at 921, 920 n.2. Because this case was decided prior to the establishment and promulgation of the State Building Code, it did not address issues of preemption. However, the holding suggests that zoning regulations related to the "safety and structure of buildings" and specifically to building materials are likely preempted.

51 This might include, for example, amending the definition of substantial repair of a foundation or substantial improvement to a threshold of less than 50% of the perimeter of the foundation or market value of the structure prior to the improvement. Note that although the City cannot amend the Building Code, it can adopt a new floodplain map that would determine which areas are subject to the flood resistant construction requirements. *See* pp. 27-30, *infra*.

52 Boston, Mass., "An Ordinance Regulating the Maintenance of Vacant, Foreclosing Residential Properties," 2008, *available at* http://www.cityofboston.gov/isd/foreclosure/ (last visited June 22, 2011).

## B. Chapter 91 Licenses

**Legal authority**: existing municipal and state authority

**Type of development**: new development and substantial redevelopment; existing development

**Options:**

- The City can consider sea level rise during new Chapter 91 licensing proceedings.
- The City can request that the Massachusetts Department of Environmental Protection ("DEP") use its authority to renew, amend, revoke, or nullify licenses to ensure continuing compliance with public access requirements.

One of the central components of the revitalization efforts in the Fort Point Channel area is the provision of public amenities such as open spaces, green areas, and recreational activities in the Channel itself, and a Harborwalk that will become part of a larger pedestrian trail linking multiple neighborhoods to the Channel.[53] Public amenities are necessary both to activate the waterfront and comply with state statutes such as M.G.L. c. 91 ("Chapter 91") and the Wetlands Protection Act ("WPA").[54] Because many of these amenities are at or near the shoreline, however, sea level rise expected as a result of climate change threatens to inundate many of them. The City could work with DEP to utilize Chapter 91 licensing to ensure that public amenities continue to be provided in the event of sea level rise.

Chapter 91 and its implementing regulations are one of the primary means by which the State regulates activities in and around bodies of water. Through Chapter 91 the State has codified the public trust doctrine, which in Massachusetts recognizes private property ownership to the low tide line, but guarantees public access to tidelands and bodies of water. Chapter 91 applies to tidelands, which are defined as "present and former submerged lands and tidal flats lying below the mean high water mark."[55] Tidelands are divided into "Commonwealth tidelands," those held by the State in trust for the public, and "private tidelands," those owned by private parties subject to a public easement for navigation, fishing, fowling, and passing over or through the water.[56] The Fort Point

53 100 Acres Master Plan, *supra* note 8, at 24-26, 39.

54 The WPA requires that local conservation commissions issue permits for construction or activities affecting water-related resources. *See* M.G.L. c. 131, § 40. Conservation commissions may hold hearings and impose conditions on permits to further the goals of the WPA. *Id.*

55 M.G.L. c. 91, § 1.

56 *Id.*

Channel neighborhood is located on Commonwealth tidelands. Chapter 91 and its implementing regulations contain detailed requirements for licensed development on Commonwealth tidelands to provide public access and protect the public trust.[57]

### (a) Consider Sea Level Rise During Licensing Proceedings

There are two options for considering the effects of sea level rise during a licensing proceeding. First, the regulations pertaining to engineering and construction standards for projects in flood zones require:

> New buildings for non-water dependent use intended for human occupancy *shall be designed and constructed to ... incorporate projected sea level rise during the design life of the building*. At a minimum, such projections shall be based on historical rates of increase in New England.[58]

This provision is separate from the project and environmental review requirements discussed in the previous section and is not currently applied.[59] The Massachusetts Executive Office of Energy and Environmental Affairs ("EOEEA") has suggested developing policy guidance pursuant to this provision that would give agencies guidelines for implementation and has also suggested expanding the provision to "include all new development and any redevelopment considered significant."[60] The City could work with EOEEA to ensure that any guidance is consistent with the City's approaches. For example, the City could request that guidance clarify the meaning of "design life" to ensure that projected sea level rise is considered for the actual time the structure is likely to be in use and not for the life expectancy of the building as modeled for business or financial purposes, which may be shorter.[61] This specific approach would also be an effective way to ensure that Adaptation Priority 13 in *Sparking Boston's Climate Revolution* is fully implemented.[62]

Second, consideration of sea level rise could be incorporated into the public benefit review mandated by Section 18 of Chapter 91. During a public benefit review, DEP considers whether development would "serve a proper public purpose and would not be detrimental of the public's rights"

57 *See, e.g.,* 310 CMR 9.00.

58 310 CMR 9.37(2)(b)(emphasis added).

59 *See* Massachusetts Climate Change Adaptation Advisory Committee, Report to the Legislature (2009) (unpublished draft, on file with the Harvard Emmett Environmental Law & Policy Clinic).

60 *Id.*

61 There is no definition of "design life" under either Chapter 91 regulations or related case law.

62 Sparking Boston's Climate Revolution, *supra* note 1, at 42.

in tidelands.[63] Given that neither the statute nor the regulations provides a list of specific factors to consider in conducting the review, DEP could look at sea level rise as a factor important to the long term protection of the public trust. DEP could accomplish this change either through a formal amendment to the regulations or by issuing informal guidance. Furthermore, the BRA conducts the initial public hearing and makes a recommendation to DEP about whether the license will serve a proper public purpose.[64] The BRA could develop a practice of requiring license applicants to consider sea level rise based upon a uniform projection. This would be an effective way for the City to influence the process of issuing licenses.

### (b) Renew, Amend, Revoke, or Nullify Licenses

The City does not have authority to renew, amend, revoke, or nullify Chapter 91 licenses directly. However, it can request that DEP amend or refuse (or threaten to refuse) to renew a license where the licensee fails to meet statutory and regulatory requirements regarding public access to tidelands.[65] Licenses are for set terms and may be renewed by DEP as long the project is in compliance, "wherever feasible, with the applicable provisions of the regulations."[66] If there has been a change in use, such as that due to sea level rise, and the licensee is no longer in compliance with the requirements, the City can ask DEP to amend the license. If DEP agrees, BRA may hold a public hearing and make a recommendation to DEP,[67] which may also hold its own public hearing.[68] During the hearings, the City or various citizen groups could request that DEP include conditions in the amendments that would require public access.[69]

If DEP determines that the change is an "unauthorized substantial change in use," DEP may revoke or nullify the license.[70] While the argument that sea level rise constitutes an "unauthorized

63 M.G.L. c. 91, § 18.

64 *Id.*

65 The waterways regulations provide for an amendment process if there have been structural alterations or changes in use. 310 CMR 9.24(1). However, DEP has to determine whether the changes are so significant as to nullify the license and require an application for a new license, or whether the changes may be accommodated within an amendment to the existing license. *Id*. at 9.24(2).

66 *See* 310 CMR 9.25; 310 CMR 9.24. the City has provided for 99-year terms for new licenses in the Fort Point Channel area. *See* 310 CMR 9.15(a). *See also* Boston Redevelopment Authority, South Boston Waterfront District Municipal Harbor Plan Amendment (May 2009).

67 310 CMR 9.13(5).

68 310 CMR 9.24(2)-(5).

69 *Id*.

70 M.G.L. c. 91, § 15 (2001). Chapter 91 provides that a license "shall be revocable at the discretion of the general court, or by the department [DEP] for noncompliance with the terms and conditions set forth therein." The waterways regulations similarly provide that "any change in use of fill or structures from that expressly authorized

substantial change in use" has not previously been made, an administrative law decision in an analogous case suggests that loss of public access due to sea level rise may be the basis for nullifying a Chapter 91 license.[71] In that case, part of the land granted by a Chapter 91 license was taken by the State through eminent domain, and DEP initiated an enforcement action to ensure the continued provision of public access despite the loss of land.[72] The Massachusetts Division of Administrative Law Appeals ("DALA") held that the taking effected an "unauthorized substantial change in use" rendering the license void. However, because the licensee was not at fault, the DALA mandated that the licensee have an opportunity to apply for a new license or variance for the existing structures that would reflect the realities of the parcel.[73] Similarly, sea level rise may result in a "taking" of portions of a licensed parcel that amounts to an unauthorized substantial change in use. DEP may then require a new licensing proceeding, during which it can impose conditions that mandate the provision of new public amenities.[74]

Sea level rise may make the provision of public access in certain areas impossible. The City and DEP will need to work together with the licensee to identify new ways to provide public access, such as through the use of floating boardwalks, walkways along the top of sea walls or bridges, or construction of public viewing platforms in buildings.[75] The City may also request that DEP

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in a valid grant or license or, if no such use statement was included, from that reasonably determined by the Department to be implicit therein" requires an application for a new license. 310 CMR 9.05(1)(d). Chapter 91 further provides that "any unauthorized substantial change in use or unauthorized substantial structural alteration shall render the license void." *Id.* at § 18. A "substantial change in use" is defined as "a use for a continuous period of at least one year of 10% or more of the surface area of the ... premises or structures for a purpose unrelated to the authorized or licensed use or activity, whether express or implied." 310 CMR 9.02. Given the extent of public access required by Chapter 91, if inundation occurs due to sea level rise, it will presumably affect 10% or more of the property and the license may become void.

71 *See In re Estuary at Port Norfolk Condominiums*, Docket No. DEP-05-426, 2006 MA ENV LEXIS 50 (Mass. Div. of Admin. Law App. 2006).

72 *Id*. at *3-6.

73 *Id*. at *14-20.

74 M.G.L. c. 91, § 14.

75 470 Atlantic Ave., a building located on the Fort Point Channel, has a rooftop observation deck open to the public. Binoculars and benches are provided to enhance the outdoor viewing experience, and an indoor viewing area is also available. A video presentation available on the first floor explains the history of the site. Video Presentation: Fort Point Channel (Boston Redevelopment Authority), http://www.bostonharborwalk.com/places-togo/location.php?nid=5&sid=29 (last visited June 22, 2011). The other options have not yet been used, but the regulations state that while a certain amount of interference with water-related public rights may be inevitable, such interference has to be mitigated to the greatest extent possible, to ensure that the "overall public trust in waterways is best served." 310 CMR 9.35(1). Therefore, mitigation of loss of public access will likely allow for these alternatives.

require the licensee to provide public amenities at a "location on or near the project site."[76] Nothing in Chapter 91, the regulations, or DEP guidance specifies what qualifies as a "location on or near the project site." This lack of clarity may make it difficult for the City to require equivalent offsite public amenities, especially if there is no available land nearby. The City may wish to ask DEP to issue guidance clarifying this term.

### C. Overlay Zones

**Legal authority**: expanded municipal authority

**Type of development**: new development and substantial redevelopment

**Option:** The City can amend its Groundwater Overlay Zone to improve stormwater management and increase onsite retention.

The City of Boston has adopted a Groundwater Conservation Overlay District ("GCOD") under Article 32 of its Zoning Code to "prevent the deterioration of…groundwater levels" and "to reduce surface water runoff and water pollution."[77] The primary focus of Article 32 is to preserve groundwater levels in order to prevent the wooden pilings under buildings and structures on filled lands from rotting. However, Article 32 also addresses efforts to improve stormwater management through reductions in runoff. This latter goal will be important for the City in addressing more frequent and heavier precipitation events resulting from climate change.

The current overlay zone applies to the Fort Point Waterfront district, but not to other areas of South Boston. Proponents of projects involving new construction or extensions of existing development within the Fort Point Waterfront district must demonstrate that the project results in no negative impact to groundwater levels on project and adjacent lots.[78] These requirements are less stringent than those imposed within other areas of the GCOD, where projects involving substantial rehabilitation of existing structures and paving must demonstrate the ability to capture at least 1 inch of rainfall.[79]

The City could expand the purposes of Article 32 to more directly address the need for improved

76 The waterways regulations state that in the event of interference with water-related public rights, a licensee must "provide compensation to the public for interfering with its broad rights to use such lands for any lawful purpose." 310 CMR 9.35(4). Compensation can include measures to "promote public use and enjoyment of the water, at a location on or near the project site." *Id*.

77 *See* Boston, Mass., Zoning Code, art. 32 § 1.

78 *See id.* at § 4.

79 *See id.* at §§ 4, 6.

stormwater management and reduced runoff in light of the expected impacts of climate change. As part of these amendments, the City could apply Article 32 requirements to a larger area of South Boston and could impose more stringent requirements, similar to those that apply in other areas of the GCOD, for managing stormwater onsite in the Fort Point Waterfront district.

### D. Wetlands Ordinance

**Legal authority**: expanded municipal authority

**Type of development**: new development and substantial redevelopment; existing development

**Option:** The City can enact a wetlands ordinance to improve stormwater management and protect coastal resources.

The City can enact a wetlands ordinance to provide additional protection to coastal resources within its jurisdiction, such as land subject to coastal storm flowage (i.e., the coastal floodplain). The Massachusetts Supreme Judicial Court has held that the WPA establishes a set of minimum standards, "leaving local communities free to adopt more stringent controls."[80] The City has yet to enact a municipal wetlands ordinance. It could, for example, use such an ordinance to establish performance standards for land in the coastal floodplain. [Note that the Clinic has drafted a model ordinance and implementing regulations for the City's consideration.]

### E. Floodplain Regulations

**Legal authority**: expanded municipal authority

**Type of development**: new development and substantial redevelopment

**Options:**

- The City can use maps identifying the future 100-year floodplain as a basis for delineating Flood Hazard Districts under Article 25 of the Boston Zoning Code.
- The City can also restrict vulnerable ground floor uses within these Districts.

The City currently uses the Suffolk County Flood Insurance Rate Map ("FIRM") developed by

80 *Golden v. Board of Selectmen of Falmouth*, 263 N.E.2d 573, 576 (Mass. 1970); *see also Lovequist v. Conservation Commission of the Town of Dennis*, 393 N.E.2d 858 (Mass. 1979) (holding that Town's wetlands bylaw imposing more stringent standards than the State Wetlands Protection Act was validly enacted pursuant to its Home Rule authority).

the Federal Emergency Management Agency ("FEMA") as the basis for identifying and regulating Flood Hazard Districts.[81] Although the Suffolk County FIRM is considered to be relatively accurate,[82] it does not take future projected changes in sea level rise into account. Because buildings within the City tend to have a life expectancy of 70 years or more, much of the new development that is now being permitted and constructed in South Boston outside the current 100-year floodplain will likely be subject to damage from future 100-year floods.

### (a) Incorporate new floodplain maps and restrict vulnerable uses

Cities faced with similar issues propose to address this problem by applying their floodplain regulations to the 100-year floodplain predicted to exist in 2080. By incorporating future projected changes in sea level rise into their floodplain regulations they seek to ensure that development constructed today will be able to withstand flooding conditions in the future. For example, New York City's Green Codes Task Force has recommended that New York City develop 2080 floodplain maps to incorporate into the City Building Code.[83] Under this approach, New York City would use both the existing FEMA FIRMs and the 2080 floodplain maps as a basis for delineating the areas in which floodplain regulations apply. The City of Boston has the authority to implement a similar approach under its Zoning Code.

The easiest way to accomplish this approach would be for the City to use the Suffolk County FIRM and an additional City-developed floodplain map as a basis for delineating the areas in which floodplain regulations apply (as proposed for New York City). Boston could choose to adopt a City-developed map that identified the future floodplain based on the average life expectancy of buildings in the area. If the average life expectancy of buildings is 70 years, then the adopted City-developed map could delineate the 2080 floodplain. The map would need to be updated periodically to incorporate this rolling standard.

The City could also restrict vulnerable ground floor uses within these newly delineated Flood Hazard Districts. Policymakers recommend restriction of vulnerable ground floor uses, or "vertical" zoning measures, as a way to adapt to incremental increases in sea level rise and the effects of more intense precipitation.[84] For example, a ground floor can be converted to parking, public space, or other uses that are more compatible with water coming and going and do not put residential or

81 *See* Boston, Mass., Zoning Code, art. 32 § 25.3.

82 Telephone Interview with Chris Busch, Executive Director, Boston Conservation Commission (Dec. 6, 2010).

83 *See* New York City Green Codes Task Force, Detailed Proposals BR-1 (February 2010), http://www.urbangreencouncil.org/greencodes/full-proposals.pdf (last visited June 22, 2011).

84 *See, e.g.*, Paul Kirshen, Presentation on "Community Options for Adapting to Climate Change," East Boston and Dorchester (Nov.-Dec., 2010).

office units at risk of direct flooding.[85]

To adopt these measures, the City would need to amend the Zoning Code to include the new floodplain maps and restrict vulnerable ground floor uses. Such amendments are likely to withstand judicial review, which is highly deferential and requires only that the amendment is not "arbitrary and unreasonable, or substantially unrelated to the public health, safety or... general welfare" and is consistent with the Constitution and state law.[86] Under this standard, the City will be able to zone based on future projections of sea level rise and restrict uses, provided it can demonstrate three things.

First, there must be a reasonable basis for including land within the future floodplain and for restricting permitted uses. Applying floodplain regulations to the future floodplain is reasonable given the expected future impacts of sea level rise and climate change on coastal areas of Massachusetts.[87] Both federal and state governments recognize that Massachusetts' coastline is vulnerable to sea level rise[88] and that current FIRMs fail to adequately account for this risk. In fact, the Massachusetts Office of Coastal Zone Management encourages communities to incorporate sea level rise and climate-related considerations into their hazard mitigation and floodplain regulations.[89] FEMA has also acknowledged that the minimum standards under NFIP, which are cur-

85 Zoning changes will, however, only apply to new uses. Existing uses will be protected as non-conforming until there is a substantial change in use. *See, e.g.*, 1 Massachusetts Continuing Legal Education, Inc., Massachusetts Zoning Manual, ch. 6, Nonconforming Uses and Structures (4th ed. 2007).

86 *Durand v*. IDC *Bellingham*, LLC, 793 N.E.2d 359, 364 (Mass. 2003) (citations omitted). Note that "[a] challenged provision in a zoning bylaw is presumptively valid, and a challenger bears the burden to prove otherwise." *Rogers v. Town of Norfolk*, 734 N.E.2d 1143, 1146 (Mass. 2000).

87 *See, e.g., Andrews v. Town of Amherst*, 862 N.E.2d 65, 74 (Mass. App. Ct. 2007) ("[A]s there is sufficient evidence in the record to show that flooding was a legitimate concern, we will not second guess the town on its judgment as to the extent of predicted flooding and the resulting need for revision of the FPC direct line".).

88 In 2007, the Supreme Court of the United States recognized the impact of climate change and resulting sea level rise on Massachusetts' coastline in *Massachusetts v. EPA*, 549 U.S. 497, 522-523 (2007) (finding that "rising seas have already begun to swallow Massachusetts' coastal land" and that "[t]he severity of that injury will only increase over the course of the next century: If sea levels continue to rise as predicted, one Massachusetts official believes that a significant fraction of coastal property will be 'either permanently lost through inundation or temporarily lost through periodic storm surge and flooding events".). In 2008, the Massachusetts General Court acknowledged the impacts of climate change, including sea level rise, on the state by its enactment of the Massachusetts Global Warming Solutions Act, 2008 Mass. Acts c. 298, § 7 (codified at M.G.L. c. 30, § 61), and now requires state and municipal agencies to take the future impacts of sea level rise into account in permitting and other decisionmaking.

89 *See, e.g.*, Massachusetts Stormsmart Coasts, Office of Coastal Zone Management, "FIRMs and FIS reports should not be used alone, but in conjunction with other methods that better identify the risks of coastal flooding and storm damage", http://ma.stormsmartcoasts.org/before/hazard-id/understanding-the-limitations-of-firms-and-fis-reports/ (last visited June 22, 2011); "Sea Level Rise Data and Projections: While the causes and future rates

rently in effect in Boston, may not be enough to protect communities and residents from future flood hazards.[90] FEMA regulations encourage local governments to utilize additional information in developing stricter floodplain regulations than those set forth in the federal regulations.[91] Thus, it is likely that the City's adoption of a floodplain map based on future floodplain projections would be upheld as reasonable. Likewise, Massachusetts courts have consistently upheld restriction of vulnerable uses within the floodplain as reasonably related to protection of the public health and safety of residents.[92]

Second, the floodplain regulations must be proportionate to expected future impacts and treat similarly situated parcels within the 100-year floodplain similarly.[93] In other words, properties with the most restrictive zoning must be the properties subject to the greatest risk of future flooding. Where flooding in the current FEMA 100-year floodplain is not projected to increase evenly across the mapped area, the City will have to adjust the floodplain maps and regulations accordingly. In doing so, the City will also need to ensure that the floodplain boundaries are clearly delineated.[94]

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are still being debated, there is a general scientific consensus that sea levels are rising. Consequently, the effects of future, higher, sea levels should be considered when making siting decisions", http://ma.stormsmartcoasts.org/before/hazard-id/finding-and-using-additional-hazard-information/ (last visited June 22, 2011).

90 A recent federally-funded evaluation of NFIP found that:

> NFIP building standards do reduce flood losses to new construction *under present day base flood events*. However, building standards are implemented in conjunction with the Flood Insurance Rate Map (FIRM), *which does not account for increasing flood hazards in the future*. Thus, while NFIP building standards may be generally effective today, *their future effectiveness will be reduced as the FIRM becomes obsolete due to changing flood conditions*.

American Institutes for Research, Evaluation of the National Flood Insurance Program's Building Standards viii (2006), *available at* http://www.fema.gov/library/viewRecord.do?id=2592 (last visited June 22, 2011) (emphasis added).

91 Section 60.1 of the regulations provides that:

> community officials may have access to information or knowledge of conditions that require, particularly for human safety, higher standards than the minimum criteria set forth in…this part. Therefore, any flood plain management regulations adopted by a State or a community which are *more restrictive than the criteria set forth in this part are encouraged and shall take precedence*.

44 C.F.R. § 60.1(d) (emphasis added).

92 *See, e.g., Turnpike Realty Co. v. Town of Dedham*, 284 N.E.2d 891, 900(Mass. 1972); *Gove v. Zoning Board of Appeals of Chatham*, 831 N.E.2d 865, 871-75 (Mass. 2005); *S. Kemble Fischer Realty Trust v. Board of Appeals of Concord*, 402 N.E.2d 100, 103 (Mass. App. Ct. 1980); *Turner v. Town of Walpole*, 409 N.E.2d 807, 808-809 (Mass. App. Ct. 1980).

93 For example, a Massachusetts Court of Appeals upheld the rezoning of a parcel from a light industrial district to a flood conservancy zone where it found that the parcel differed from the surrounding area because it was covered with waterways important for flood control and where other flood-prone parcels not included in the district were already subject to agricultural preservation restrictions. *Andrews*, 862 N.E.2d at 70-73.

94 Zoning boundaries that are not clearly delineated may be unconstitutionally vague and any ambiguity will likely

Third, to avoid takings claims, the City will need to ensure that property owners subject to the amended floodplain regulations retain more than a "token interest" in the property[95] and that the regulations do not frustrate property owners' "distinct investment-backed expectations" for the property.[96] While neither regulation on its face would constitute a taking requiring just compensation,[97] extension of the current floodplain regulations could constitute a taking if, as applied, it rendered a property devoid of all economic value. The bar is high, however, as Massachusetts courts have demonstrated a consistent unwillingness to overturn floodplain regulations even where the economic impact of the regulations is relatively significant.[98]

For further discussion of Constitutional limits on zoning, see Appendix A.

Note that while the City can amend the Zoning Code to incorporate new floodplain maps based on future sea level projections and restrict vulnerable uses consistent with those maps, the City cannot incorporate standards for flood resistant construction into the Zoning Code. The State Building Code provides standards for Flood Resistant Construction and municipalities cannot make their own changes to the Building Code or regulate in the domain covered by the Building Code.[99] "Whereas the main purpose of zoning is to stabilize the use of property and to protect an area from deleterious uses, a building code relates to the safety and structure of buildings."[100] Because the City's floodplain regulations work in coordination with the State's requirements for Flood Resistant Construction, efforts to incorporate future climate impacts into floodplain regulations should be coordinated with measures to improve the resilience of building design in these areas. Options for accomplishing this are considered in the next section of the paper.

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be resolved in favor of the property owner. *See, e.g., Jenkins v. Pepperell,* 465 N.E.2d 268, 272 (Mass. App. Ct. 1984).

95 *See Lucas v. South Carolina Coastal Council,* 505 U.S. 1003, 1009 (1992).

96 *Penn Central Transportation Co. v. New York City*, 438 U.S. 438 U.S. 104, 124 (1978).

97 *See Blair v. Department of Conservation and Recreation*, 932 N.E.2d 267, 271-72 (Mass. 2010)(rejecting a facial attack on a zoning regulation that included exceptions and variance provisions because "[a] statute does not, on its face, effect an unconstitutional taking when there are any circumstances in which an owner retains an economically viable use of his or her own property").

98 *See, e.g. Gove,* 831 N.E.2d at 871-75 (rejecting a takings claim based on application of the Town of Chatham's zoning code to deny a residential building permit for a property within the coastal floodplain where other uses remained viable and the property retained an estimated value of $23,000, over $320,000 less than its appraised value if residential building were permissible).

99 *See supra* notes 50 and 51.

100 *Enos v. City of Brockton*, 236 N.E.2d 919, 921 (Mass. 1968).

### (b) Ensure Conformance with NFIP

The City must continue to demonstrate that its floodplain restrictions meet the minimum requirements for participation in the National Flood Insurance Program ("NFIP"). NFIP was established under the National Flood Insurance Act of 1968 "to provide previously unavailable flood insurance protection to floodplain and flood-prone areas."[101] NFIP makes federally subsidized flood insurance and other financial support (e.g., federally backed loans) available to property owners located in flood-prone areas only if their communities participate in the program.[102] In order to participate, communities must adopt floodplain regulations that meet or exceed NFIP's minimum criteria.[103] The Suffolk County FIRM was developed by FEMA for the administration of NFIP.[104] Article 25 of the Boston Zoning Code, Appendix 120.G of the Massachusetts State Building Code,[105] the Massachusetts Wetlands Protection Act,[106] and title V of the State Environmental Code[107] comprise most of the minimum criteria required under NFIP.

Although the Suffolk County FIRM was developed to implement NFIP, neither NFIP regulations nor the State Building Code explicitly requires that the City's Zoning Code delineate the floodplain on the basis of the Suffolk County FIRM. FEMA regulations emphasize that "community officials may have access to information or knowledge of conditions that require, particularly for human safety, higher standards than the minimum criteria" and provide for more stringent standards to take precedence.[108] Thus, the City may use different maps to regulate the floodplain under its Zoning Code and to demonstrate compliance with NFIP.

The easiest way to coordinate continued participation in NFIP and compliance with state law may be to follow New York City's proposed approach and continue to use the FEMA FIRM to delineate

101 44 C.F.R. § 59.2(a). NFIP regulations define floodplain or flood-prone areas to include "any land area susceptible to being inundated by water from any source." 44 C.F.R. § 59.1. Flood-prone areas are identified through Flood Insurance Studies ("FISs") conducted by FEMA. Information from these studies is included in FIRMs, which categorize flooding hazards according to different zones. NFIP regulations determine the specific land use and construction-related requirements for each zone and establish the flood insurance premiums to be charged in these areas. *See* 44 C.F.R. §§ 63-64.

102 42 U.S.C. § 4106(a) (2010). *See also* FEMA, NFIP Program Description 17 (2002), *available* at http://www.fema.gov/library/viewRecord.do?id=1480 (last visited June 27, 2011).

103 44 C.F.R. § 59.22.

104 Boston, Mass., Zoning Code, art. 25 § 5.

105 780 CMR 120.G.

106 M.G.L. c. 131, § 40.

107 310 CMR 15.000. Title V of the State Environmental Code includes requirements for installation and replacement of septic and other sewage systems within the floodplain.

108 44 C.F.R. § 60.1(d).

the existing 100-year floodplain, while incorporating future floodplain maps to determine the future extent of the 100-year floodplain.

## F. Resilient Building Design

**Legal authority**: expanded and new municipal authority

**Type of development**: new development and substantial redevelopment; existing development

**Options:**

- The City can incorporate flood-related performance standards into Article 80 of the Boston Zoning Code, similar to its approach to green building.
- The City can request that the BBRS pass more stringent flood-resistance standards for Boston or create a flood-resistance stretch code that Boston and other municipalities could adopt.

Appendix 120.G of the State Building Code establishes standards for Flood Resistant Construction in the 100-year floodplain identified in a community's FIRM.[109] These standards range from requirements related to anchorage and water-resistant materials to placement of mechanical and electrical systems.[110] Because the State Building Code also relies on the Suffolk County FIRM as a basis for delineating the areas in which standards for Flood Resistant Construction apply, such standards would not be applied to the future floodplain unless further measures are adopted. This section looks at opportunities for the City to incorporate performance standards for flood resistant design into its Zoning Code and to work with BBRS to ensure that new construction is built to withstand the impacts of flooding in the future.

109 The standards in Appendix 120.G, which apply to one and two-family detached dwellings, are incorporated into the Basic Building Code, which applies to all other buildings, under 780 CMR 1612.1. *See* 780 CMR 120.G. That section provides that "[d]esign and construction in flood zones *shall be in accordance with* ASCE 24 and *780 CMR 120.G.*" *Id.* (emphasis added). Although "flood zones" is not defined anywhere in the Building Code, Appendix 120.G does apply to "Flood Hazard Zones" and "High-Hazard Zones" which are defined respectively as the A-Zones and V-zones delineated on a community's FEMA FIRM. *See* 780 CMR 120.G201. Other provisions within the Basic Building Code also refer to "flood-hazard areas" and to FIRMs, suggesting that the BBRS intended the requirements for Flood Resistant Construction to apply to all buildings located within the 100-year floodplain as identified on a municipality's FIRM. *See, e.g.,* 780 CMR 1603.1.

110 *See* 780 CMR 120.G501-G601.

### (a) Adopt Flood-Resistance Requirements in Article 80

The City could incorporate flood-resistance standards into its design review procedures under Article 80 of its Zoning Code. This option would be similar to Boston's approach to green building, in which large projects are required to demonstrate they are "LEED-certifiable" during design review.[111] The City could require that certain projects within the current and future 100-year floodplain demonstrate a given level of flood performance based on the attainment of points under FEMA's Community Rating System ("CRS"). The City could also develop Boston-specific points, or specify categories of points under CRS that are appropriate only for certain districts (e.g., raising the building's base elevation over a certain number of feet). Incorporation of flood-resistance requirements might be subject to preemption where such requirements relate to flood-resistance standards covered under the State Building Code.

### (b) Impose Flood-Resistance Requirements Under the State Building Code

#### 1. Boston-Specific Standards

The City could request that the BBRS pass more stringent requirements for Flood Resistant Construction in the current and future 100-year floodplain in Boston. This might include the adoption of future floodplain maps as well as more stringent standards for Flood Resistant Construction in areas identified in the current Suffolk County FIRM. State law provides that "the mayor in a city may recommend to the [BBRS] the adoption of rules and regulations imposing more restrictive standards than those established by the state building code."[112] The mayor is required to demonstrate that more restrictive standards are "reasonably necessary because of special conditions" within the city, and that the standards conform with accepted engineering and safety practices, and the general purposes of the State Building Code.[113]

Based on the language of the statute, Boston seems well situated to request more stringent regulations from the BBRS. As a densely populated, coastal urban area, Boston faces threats from climate change that are of a different scale than those faced by municipalities that are less populous or located further inland. In terms of its elevation, proximity to the sea, the number of people and the amount and value of property at risk from climate change impacts, Boston is unique among cities and towns in Massachusetts and would likely qualify for more restrictive standards under this provision. Should it choose to propose more restrictive flood resilience standards to the BBRS, the

111 *See* Boston, Mass., Zoning Code, art. 80 and 37.

112 M.G.L. c. 143, § 98.

113 *Id.*

City will want to ensure that these standards conform with national and local engineering and fire prevention practices, promote public safety, and resonate with the purposes of the State Building Code. Requests to impose more stringent requirements on the current and future 100-year floodplain in accordance with NFIP standards and under the CRS are likely to meet these requirements.

### 2. Stretch Code for Flood Resistant Construction

Alternatively, the City could request that the BBRS adopt a Stretch Code for Flood Resistant Construction under the State Building Code. (The City does not have the authority to compel BBRS to do so.) It could be based on the Stretch Energy Code adopted into the State Building Code in August 2009, and since adopted by the City of Boston in November 2010.[114] The Stretch Energy Code provides the opportunity for municipalities to adopt more stringent energy efficiency standards than those afforded in the Basic Energy Code. Similarly, a Stretch Code for Flood Resistant Construction would provide the opportunity for Massachusetts' municipalities to opt for more stringent standards than those currently provided for in Appendix 120.G of the State Building Code. In order to provide for more stringent standards in both the current and future 100-year floodplain, the City would need to work with the BBRS to ensure that maps of the future 100-year floodplain in each community are incorporated by reference or otherwise into the Stretch Code.

114 *See* Mass. Dept. of Public Safety, Energy Conservation 'Appendix 120 AA' Approved, http://www.mass.gov/?pageID=eopsmodulechunk&L=3&L0=Home&L1=Public+Safety+Agencies&L2=Massachusetts+Department+of+Public+Safety&sid=Eeops&b=terminalcontent&f=dps_bbrs_build_code_changes_public_hearing&csid=Eeops (last visited June 22, 2011).

# 3. PUBLIC INVESTMENT

## A. Procurement

**Legal authority**: existing municipal authority

**Type of development**: new development and substantial public redevelopment; existing public development

**Option:** The City can use its procurement policies to mandate use of materials that will aid adaptation, such as use of flood-resistant materials in public buildings subject to future flooding.

Mayor Menino's 2007 Executive Order on Climate Action mandates that planning for all municipal construction and major renovation evaluate the risks posed by climate change and identify steps to avoid, minimize or mitigate those risks to the project.[115] Procurement policies and practices provide an opportunity to incorporate adaptation considerations into public purchasing decisions, including new construction and major renovation. In 2008, recognizing the "power of the purse," Mayor Menino issued an Executive Order mandating the use of environmentally-friendly cleaning products and practices.[116] Pursuant to this Order, the City developed Environmentally Preferable Procurement ("EPP") guidelines[117] relating to building maintenance and operations.[118] Such an approach could also be used to aid adaptation efforts by ensuring that public works projects are built to withstand the expected impacts of climate change.

The EPP guidelines state that although environmentally preferable materials may initially be more costly, departments are entitled to, and should, consider complete life-cycle costs including acquisition, warranties, operation, supplies, maintenance, insurance and other liability, and disposal.[119] EPP products often have a higher purchase price than their less efficient counterparts, but can save money over their lifetime, because they use less energy, often have a longer life, and typically incur

115 City of Boston, An Order Relative to Climate Action, ¶ 5 (April 13, 2007) [hereinafter Executive Order on Climate Action].

116 City of Boston, An Order Relative to Greening City Building Maintenance & Operations 1 (July 3, 2008) [hereinafter Executive Order on Greening].

117 City of Boston, Environmentally Preferable Procurement 1 (2009) [hereinafter Environmentally Preferable Procurement].

118 *See* Executive Order on Greening, *supra* note 116, at 2-3.

119 *See* Environmentally Preferable Procurement, *supra* note 117, at 6.

less maintenance cost. These elements must be built into the bid to be factored in the award.[120]

Each Department is responsible for implementing the EPP policies and for ensuring that its procurement decisions are consistent with EPP.[121] While the City must generally award a contract to the lowest cost bidder, only the lowest cost bidder who meets the specified criteria is eligible for the contract.[122]

The City could amend the Executive Order on Climate Action to directly require consideration of adaptation in purchasing decisions and develop guidelines for implementing the directive. The City could mandate that materials and services be purchased with future impacts in mind, such as increased heat waves, flooding, more intense storm events, and sea level rise. For example, flood-resistant materials could be used to increase the capacity of a building to withstand intense storm events, and materials used to build roads could be selected based on their ability to resist buckling due to heat waves. The EPP guidelines can be used as a model, since they allow for the consideration of future maintenance costs and the overall life-span of a product, both of which are suitable factors on which to base consideration of how materials will further adaptation efforts. By building these sorts of criteria into its procurement requests, the City can ensure that contracts it awards are consistent with the City's goals to prepare for climate change adaptation.

120 *Id.* at 6. Although the purchasing of goods is centralized with Boston's Purchasing Department, procurement for services is decentralized and handled by individual departments. *Id.* at 5.

121 *Id.* at 6.

122 In Massachusetts, a contract for services must generally be awarded via an invitation for quotes (IFQs), an invitation for bids (IFBs), or a request for proposals (RFPs). Under the IFQ and IFB processes, the contract must be awarded to the qualified vendor offering the best price. M.G.L. c. 30B, §§ 4(b), 5(g). If a Department utilizes the RFP process, it awards the contract to the bidder offering the most advantageous proposal, which may not represent the lowest cost. M.G.L. c. 30B, § 6(g). Under either scenario, a department's discretion to reject a bid is based largely (RFPs) or entirely (IFQs, IFBs) on the criteria specified in the bid. *See generally* Office of the Inspector General, The Chapter 30B Manual: Legal Requirements, Recommended Practices, and Sources of Advice for Procuring Supplies, Services, and Real Property, (6th Edition, May 2011), *available at* http://www.mass.gov/ig/publ/30bmanl.pdf (last visited June 27, 2011).

## B. Capital Planning

**Legal authority**: existing municipal authority

**Type of development**: new development and substantial public redevelopment; existing public development

**Option:** The City can use its capital planning process to identify and prioritize investments to maintain, renovate, and upgrade public infrastructure to reduce vulnerability to the impacts of climate change.

Boston's 5-year Capital Plan supports strategic investments in infrastructure that promote economic development, neighborhood revitalization, and public health and safety while also laying the foundation for future growth.[123] The Office of Budget Management ("OBM") solicits requests from departments on an annual basis regarding their facility, equipment, infrastructure, and planning needs.[124] To receive funding, project requests must meet at least one of the threshold criteria, including improvement of health and safety, mitigation of an environmental hazard, and response to a legal or administrative mandate.[125]

The City can use its capital planning process to prioritize investments to maintain, renovate, and upgrade public infrastructure to reduce vulnerability to sea level rise and coastal flooding. This effort would directly address the Mayoral Directive to evaluate and avoid, minimize, or mitigate the risks posed by climate change to new construction or major renovation in the 2007 Executive Order on Climate Action. Adaptation-related project requests would qualify as improving the public health and safety, mitigating an environmental hazard, and responding to an administrative mandate.

The effort could form part of a larger, adaptation planning process in which each department assesses its vulnerability to climate change and identifies a related set of capital needs. To facilitate the incorporation of adaptation considerations into its Capital Plan, OBM could include explicit criteria related to adaptation to be used in evaluating capital requests or it could clarify the ways in which adaptation projects meet existing criteria. For example, a request to retrofit a public park to collect and hold stormwater during an intense precipitation event would mitigate flood hazards, reduce stormwater runoff, and prevent damage to surrounding public and private development. OBM could also identify adaptation-related investments as a priority and work with departments to measure savings, such as avoided damages, from adaptation-related capital investments. Finally,

123 City of Boston, Capital Plan FY2011-2015 153 (2010), *available at* http://www.cityofboston.gov/Images_Documents/08%20Capital%20Planning_tcm3-16346.pdf (last visited June 22, 2011).

124 *Id.* at 155.

125 *Id.*

the City might also commit to build all public buildings to certain flood performance standards as it has done with respect to LEED.

### C. Regional Cooperation

**Legal authority**: existing municipal authority

**Type of development**: n/a

**Options:**

- The Boston Water and Sewer Commission ("BWSC") can work with other municipalities to reduce their inflows to Boston, perhaps charge them for the additional costs, and/or co-finance stormwater management projects in other municipalities to increase Boston's own reserve capacity and reduce combined sewer overflows ("CSOs").
- The City can encourage the Massachusetts Water Resources Authority ("MWRA") to improve Boston's stormwater flow through its capital improvement program.

Increased precipitation due to climate change will place greater stress on Boston's stormwater management system,[126] which is already at risk for CSOs when rainfall exceeds 0.5 inches.[127] Surrounding municipalities contribute stormwater to Boston's sewer system, which in turn contributes to CSOs and makes it difficult for Boston to manage its wastewater. Due to this arrangement, contributing municipalities do not have an incentive to reduce their input. The fact that metropolitan Boston is highly developed also means that the City does not have the flexibility necessary to increase its reserve capacity.

The BWSC can work with the water and sewer commissions of surrounding municipalities to help reduce outside contributions to the system, increase Boston's reserve capacity, and relieve stress on the system as a whole. The BWSC is a legislatively created commission that owns, maintains, and operates the water and sewer systems for the City of Boston.[128] One of the BWSC's purposes is

126 *See* Mass. Dept. of Envtl. Prot., Managing Infiltration and Inflow in MWRA Community Sewer Systems 1, 2 (2010), *available at* http://www.mass.gov/dep/water/laws/mwraii09.pdf.

127 Boston Water & Sewer Comm'n, Combined Sewer Systems & Outfall Maps, http://www.bwsc.org/about_bwsc/systems/outfall_maps/outfall_maps.asp (last visited June 22, 2011). CSO discharges occur when the volume of stormwater in a combined sewer system exceeds its capacity and both sanitary and stormwater are discharged into a waterway.

128 *See* Boston Water & Sewer Comm'n, About BSWC, http://www.bwsc.org/ABOUT_BWSC/organization.asp (last visited June 27, 2011).

to "provide a means to the city for the improvement of water and sewage systems."[129] Its enabling legislation gives the BWSC broad authority to undertake action in support of its purposes.[130] It also has the authority to enter into joint service agreements with organizations in other jurisdictions so long as it receives approval from the city council and the mayor.[131] Options available to the BWSC include pushing back on other municipalities to internalize their costs and increase Boston's reserve capacity, and/or co-financing stormwater management projects in other municipalities. These approaches could be an effective way to improve the system and would be consistent with the mandates of the BWSC's enabling legislation.[132]

If the BWSC opts for a co-financing approach, it may be able to recoup funding for these projects through a general increase in rates for its users. As a legal matter, the BWSC enjoys broad discretion in setting rates.[133] However, as a practical matter, it may be politically difficult for the BWSC to charge

129 1977 Mass. Acts Ch. 436, § 1.

130 *See id.* at § 6 (BWSC has the authority to "make contracts of every name and nature" and to "do all things necessary, convenient or desirable to carry out the purposes of this act or the powers expressly granted or necessarily implied in this act."); *see also id.* at § 7 (The BWSC "shall have the power to construct or acquire any improvement, extension or enlargement or any alteration, reconstruction or remodeling of the water works system and sewage works system and to pay the cost of any such work out of its revenues."). In addition, the BWSC has a statutory obligation to develop three-year Capital Improvement Programs ("CIPs") that outline the projects necessary to maintain and improve the water and sewer system. 1977 Mass. Acts Ch. 436, § 7(a). Under the 2011-2013 CIP, several projects are currently underway to improve stormwater management, but these projects are all being done within the City. Boston Water & Sewer Comm'n, 2011-2013 Capital Improvement Program, Intro 1-2 (2010) *available at* http://www.bwsc.org/ABOUT_BWSC/reports/PDFs/cip_2011.PDF.

131 M.G.L. c. 40, § 4A provides that "[t]he chief executive officer of a city or town, or a board, committee or officer authorized by law to execute a contract in the name of a governmental unit may, on behalf of the unit, enter into an agreement with another governmental unit to perform jointly or for that unit's services, activities or undertakings which any of the contracting units is authorized by law to perform, if the agreement is authorized by the parties thereto, in a city by the city council with the approval of the mayor." A "governmental unit" includes "a water and sewer commission established under chapter 40N or by special law." *Id.* The Boston Water and Sewage Commission is established by special law, and thus falls within this definition. *See* M.G.L. c. S17, § 3 (establishing the Boston Water and Sewage Commission). Moreover, the Commission contains a three-person board that is authorized to contract on behalf of the unit. *See id.* at § 3 ("[T]he powers of the commission shall be exercised by a board of three members."); *id.* at § 6(m) (granting the commission the power "to make contracts of every name and nature").

132 Nothing within the enabling act or current practices limits the BWSC to acting only within the City or prevents the BWSC from supporting projects outside the territorial jurisdiction.

133 The BWSC broad discretion in setting fees, provided the Commission's expenses are covered each year. *See* 1977 Mass. Acts Ch. 436, §§ 7(b)-(c); Boston Water & Sewer Comm'n, 2011 Rate Document 28, *available at* http://www.bwsc.org/ABOUT_BWSC/reports/PDFs/2011_ratedoc.PDF. The Harvard Emmett Environmental Law & Policy Clinic is not aware of any caselaw directly addressing the BWSC's rate-setting methodology. However, given the BWSC's organizational similarities to the MWRA, it is likely a court would review rate-setting methodology for both entities in the same way. Massachusetts courts review MWRA rate setting methods as regulations. *City of Quincy v. Massachusetts Water Resources Auth.,* 658 N.E.2d 145, 147-148 (citing *Steinbergh*

unequal fees, particularly given that the BWSC has historically charged equal, flat or tiered rates.

Alternatively, the City could encourage the Massachusetts Water Resources Authority ("MWRA") to improve Boston's stormwater flow through its capital improvement program. The MWRA is a public authority established to provide water and sewer services to 61 communities in the greater Boston metropolitan area.[134] The statutory purpose of the MWRA is to efficiently and economically operate the water delivery and sewage collection system and promote water conservation and public health.[135] It accomplishes these objectives in part through its annual capital improvement program, which includes improvements to its wastewater system.[136]

The MWRA is already investing in improvements to its stormwater system. In 1995, MWRA began implementing its CSO Control Plan, under which it has completed 26 of 35 identified CSO Control projects.[137] Over the next nine years, MWRA plans to continue implementation of CSO control projects, while also increasing expenditures on asset preservation, aimed at improving existing infrastructure to retain and enhance functionality, and water redundancy projects that increase the reliability of the water system during emergencies by "eliminating or managing single points of failure within the system."[138] Although not specifically aimed at climate change adaptation, completion of these projects may increase the City's climate change preparedness, by increasing MWRA's ability to respond to storm events.[139]

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*v. Rent Control Bd.,* 571 N.E.2d 15, 17 (Mass. 1991)). Under Massachusetts law, regulations "stand on the same footing as statutes and all rational presumptions are to be made in favor of their validity." *Greenleaf Finance Co. v. Small Loans Regulatory Bd.,* 385 N.E.2d 1364, 1371 (Mass. 1979). The Supreme Judicial Court has held that the MWRA has broad discretion to set rates, and need only "consider, but not necessarily to include, the statutory factors in its assessment methodology." *City of Quincy*, 658 N.E.2d at 147-148.

134 Massachusetts Water Resources Authority, "About MWRA", http://www.mwra.state.ma.us/02org/html/whatis.htm (last visited June 22, 2011).

135 *See* 1984 Mass. Acts Ch. 372, § 1.

136 *See, e.g.,* MWRA, Capital Improvement Program, http://www.mwra.com/finance/cip.htm (last visited June 22, 2011).

137 *See* MWRA, Combined Sewer Overflows, http://www.mwra.state.ma.us/03sewer/html/sewcso.htm (last visited July 21, 2011).

138 *See* MWRA, Capital Improvement Program Proposed Fiscal Year 2012, at 1-4 (2011), *available at* http://www.mwra.com/finance/cip/fy12proposed/document.pdf.

139 The MWRA is also specifically discussing and planning for climate change adaptation. *See Power Point Presentation, Early Experiences in Climate Change Adaptation: Lessons from the MWRA*, *available at* http://adaptationnetwork.org/assets/LessonsFromDeerIslandTreatmentPlantStephenEstes-Smargiassi.pdf. For example, the MWRA built the Dear Island sewage treatment plan on higher ground to accommodate sea level rise. *Id*.

# 4. FUNDING FOR SPECIFIC ADAPTATION MEASURES

## A. FEMA Funding for Hazard Mitigation

**Legal authority**: existing municipal authority

**Type of development**: n/a

**Options:**

- The City can use FEMA Hazard Mitigation Grant Program planning funds to assess its vulnerability to climate change-related hazards as part of its Hazard Mitigation Plan update.
- The City can use this plan to access further federal grant funding to reduce its vulnerability to climate change-related natural hazards.

In order for the City effectively to adapt to climate change, it must conduct a comprehensive climate change vulnerability assessment to determine which areas of the City are most at risk, and which adaptation efforts will be most effective in those areas. The City has the opportunity to access federal funds for assessing and reducing its vulnerability to climate-related natural hazards through the Hazard Mitigation Grant Program ("HMGP").

FEMA and certain state agencies—including the Massachusetts Emergency Management Agency ("MEMA") and the Massachusetts Department of Conservation and Recreation ("MDCR")—implement the HMGP to help state, local, and tribal governments mitigate the costs of disasters before they happen. HMGP provides money both for projects to reduce vulnerability to disasters and other natural hazards (e.g., buying severe repetitive loss properties) and for planning (Hazard Mitigation Plans ("HMPs")) to determine what measures should be taken to reduce vulnerability and which projects should be funded.

### (a) Grant Funding for Hazard Mitigation Planning

In Massachusetts, regional planning agencies receive HMGP funds to develop regional HMPs and annexes for participating communities.[140] The Metropolitan Area Planning Council (MAPC), the regional planning agency for the Boston metropolitan area, developed a regional HMP for its Inner

140 *See* Commonwealth of Massachusetts, State Hazard Mitigation Plan 186 (2010) [hereinafter State Hazard Mitigation Plan], *available at* http://www.mass.gov/Eeops/docs/mema/disaster_recovery/mass_haz_mit_plan2010_official.pdf.

Core sub-region in 2008 that includes an annex for the City of Boston. Boston's 2008 Annex is scheduled to be updated in 2013. The City can use FEMA HMGP funds to assess its vulnerability to climate change-related hazards as part of its HMP update.[141]

Although the assessment of climate change in HMPs is not expressly required by the Act, including climate change in the HMP is consistent with the Act's intent and with FEMA's implementing regulations. The Act requires that HMPs "describe actions to mitigate hazards, risks, and vulnerabilities identified under the plan" and "establish a strategy to implement those actions."[142] FEMA regulations require that updated Plans "reflect changes in development, progress in local mitigation efforts, and changes in priorities."[143] FEMA guidance explains that the update "involves a comprehensive review and update of *each section* of the Local Mitigation Plan,"[144] including a review and update of the risk assessment. Specifically, "the local risk assessment update shall address any newly identified hazards that have been determined to pose a threat. If improved descriptions of hazards are available, they should [also] be incorporated."[145] Thus, the update to Boston's 2008 Annex must address newly identified hazards and incorporate improved descriptions of hazards, such as those resulting from sea level rise and coastal flooding expected as a result of climate change.

Further, in addressing the risks of sea level rise, the Act and FEMA's implementing regulations indicate that the HMP can rely on both historic data and predictions of future events. The structure and history of the Act make it clear that Congress intended the program to be forward-looking rather than backward-looking. The Act's primary innovation was to establish a *pre*-disaster rather than *post*-disaster program, encouraging strategic mitigation as a way to reduce the cost of recovery from natural hazards.[146] Thus, while it does not necessarily follow that Congress intended to require the Program's risk assessments to use future-oriented models rather than merely historical data, the use of such-future oriented models would be consistent with the general approach of the Act.

FEMA has likewise contemplated that historical data would form a part, but not necessarily all, of

141 FEMA regulations require that local jurisdictions review and revise their HMPs and resubmit them for approval "within 5 years" to maintain eligibility for project grant funding. *See* 44 C.F.R. § 201.6(d)(3). The state also requires that local HMPs be updated every 5 years, although it could choose to establish a schedule for more frequent local HMP updates. FEMA, Local Multi-Hazard Mitigation Planning Guidance 9 (July 1, 2008) [hereinafter FEMA, Local Guidance], *available at* http://www.fema.gov/library/viewRecord.do?id=3336.

142 42 U.S.C. § 5165(b)(1)–(2).

143 44 C.F.R. § 201.6(d)(3).

144 Fema, Local Guidance, *supra* note 141, at 8.

145 *Id.* at 31.

146 S. Rep. No. 106-295, at 3-4 (2000).

the basis of HMP risk assessments.[147] FEMA's regulations, passed pursuant to the Act, state that "[t]he plan shall include information on *previous occurrences* of hazard events and on the *probability of future hazard* events."[148] Other provisions of the regulations suggest that FEMA contemplated that HMPs would account for future changes and use the best information available. For example, in assessing vulnerability, FEMA explicitly requires consideration of "land uses and *development trends* within the community so that mitigation options can be considered in future land use decisions."[149] In describing the planning process, FEMA encourages local governments to solicit the views of a broad swath of the public and to incorporate *all* appropriate information available into its plans.[150] Finally, a 2008 FEMA guidance document suggests that local governments should have discretion regarding whether to include considerations of climate change when conducting risk assessments.[151]

Note that, as a "managing state," Massachusetts (MEMA and MDCR in particular) could prescribe whether and how Boston accounts for climate change in its risk assessment.[152] It is unlikely, however, that Massachusetts would create a barrier to using climate change–sensitive models to conduct risk assessments. In particular, MEMA and MDCR (and, conditionally, FEMA) have already approved local plans that reference the effects of climate change on potential natural hazards,

147 Given that the Act does not specify how local governments should conduct risk assessments, FEMA's interpretation will govern, unless it is (1) beyond the range of reasonable interpretation of the statute, *see Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837 (1984), or (2) arbitrary or capricious, *see* 5 U.S.C. § 706(2)(A) (2006).

148 44 C.F.R. § 201.6(c)(2)(i).

149 *Id*. at (c)(2)(ii)(C) (emphasis added).

150 *Id*. § 201.6(b). *See also* Interim Final Rule, 67 Fed. Reg. 8844, 8845 (Feb. 26, 2002) (noting a goal of promoting "comprehensive and integrated plans").

151 Fema, Local Guidance, *supra* note 141. First, the Guidance professes to take "a 'performance standard,' rather than a 'prescriptive' approach to the planning requirements," limiting its requirements to "*what* should be done ... rather than specify exactly *how* it should be done." *Id.* at 5 (emphasis in original). This "performance standard" approach suggests the Local Guidance (and accordingly the regulations it interprets) intentionally left the choice of how to conduct risk assessments to the discretion of local governments. Second, the Local Guidance merely recommends, but does not require, that local plans describe the sources used to identify hazards. *Id*. at 30. There is a compelling argument that the greater discretion not to disclose the sources used in identifying hazards includes the lesser discretion to choose those sources in good faith. The guidance further supports this argument by providing a non-exhaustive list of potential sources for identifying hazards that includes "talking to experts" from agencies and universities without qualifying the manner in which they should bring their expertise to bear. *Id*. Finally, by inviting "descriptions of *all* the hazards that *could* affect the jurisdiction," rather than those that are likely to affect it, FEMA suggests a general preference for risk assessments to be over- rather than under-comprehensive. *Id.* at 29.

152 42 U.S.C. § 5170c(c)(1) (2006); *see also* FEMA, Local Guidance, *supra* note 141, at 6. Although managing states must follow FEMA regulations in conducting reviews of local Plan applications, the regulations delegate "approval authority" to those states. 44 C.F.R. § 201.6(d)(1), (d)(4) (2010).

including Boston's 2008 Annex.[153] The recently approved 2010 State Hazard Mitigation Plan also includes a section on climate change impacts in its discussion of future natural hazards.[154]

Given the mandate of the statutes and regulations, the HMGP represents an important potential source of funding for Boston to assess its vulnerability to natural hazards caused or exacerbated by climate change. Likewise, because the existing legal framework permits HMGP funding to be used in a manner sensitive to climate change, this may present an especially effective avenue for the City to advocate for FEMA to explicitly support climate change vulnerability assessments through the development of guidance and increased funding.

### (b) Grant Funding for Hazard Mitigation Projects

The City should review the pre- and post-disaster mitigation project grants and consider ways to best access project grants to address climate adaptation. HMPs provide the basis for local governments to receive federal grant funding under the pre-disaster Mitigation Grant Program, the post-disaster Hazard Mitigation Grant Program, the Flood Management Assistance Program, and the Repetitive Flood Claims and Severe Repetitive Loss Programs.

To be eligible for pre- and post-disaster funding in Massachusetts, projects must (i) be in conformance with the State and Local Hazard Mitigation Plan, (ii) be in compliance with relevant local, state, and federal law, (iii) mitigate a hazard rather than merely identify or analyze one, and (iv) meet FEMA's cost-effectiveness criteria.[155] Eligible activities range from property acquisition and demolition or relocation to floodproofing and retrofitting existing buildings.[156] The state prioritizes projects that "involve non-structural, or 'low cost' solutions (i.e., updating and enforcing local

153 *See* MAPC, City of Boston Metro-Boston Multi-Hazard Mitigation Plan Local Annex 15 (Mar. 2008) (on file with the Harvard Environmental Law & Policy Clinic) ("Federal studies have predicted that the average temperature in New England will increase 6 to 10 degrees Fahrenheit during this century. Impacts include ... changes in rain and snowfall patterns, sea-level rise, and greater coastal storm damage. In other words, many of the natural hazards discussed earlier could have greater impacts in the future."). *See also* Town of Franklin, Metro Boston South/West Hazard Mitigation Plan Local Annex 20–21 (Mar. 30, 2009) (on file with the Harvard Emmett Environmental Law & Policy Clinic) ("Climate change and extreme temperatures are two additional natural hazards that can have impacts on people and property.").

154 *See* State Hazard Mitigation Plan, *supra* note 140, at 112-115.

155 *Id.* at 199-200. FEMA provides grant applicants with software for conducting a benefit-cost analysis to determine whether the proposed project meets the cost effectiveness criteria. The benefit-cost analysis utilizes a discount rate of 7% for most projects, in accordance with standardized methodologies for conducting benefit-cost analysis required by the Office of Management and Budget ("OMB"). FEMA, Benefit-Cost Analysis, http://www.fema.gov/government/grant/bca.shtm (last visited June 22, 2011).

156 FEMA, Hazard Mitigation Assistance Unified Guidance 11-23 (2010), *available at* http://www.fema.gov/library/viewRecord.do?id=4225.

flood ordinances); retrofitting high-risk structures (i.e., elevating residences in coastal flood zones) and the acquisition of repetitive loss storm-damaged structures."[157] Proposals are funded on a competitive basis. The Director of MEMA and the Commissioner of MDCR make recommendations for local project funding to the regional FEMA office, based on the advice of the State Interagency Hazard Mitigation Committee. Proposals for funding are evaluated and prioritized by the Committee and the State Hazard Mitigation Team based on a set of established criteria, enumerated in the Massachusetts Mitigation Grants Administrative Plan.[158]

### B. Community Development Block Grant (CDBG) Funding

**Legal authority**: existing municipal authority

**Type of development**: n/a

**Option:** The City can utilize Community Development Block Grants to fund projects that help reduce vulnerability to climae change in low-income neighborhoods.

The City can utilize Community Development Block Grants ("CDBG") to fund projects that reduce vulnerability to climate change in low-income neighborhoods. CDBG funding is authorized under the Housing and Community Development Act of 1974 (the "Act") and awarded annually to entitlement communities by the Department of Housing and Urban Development ("HUD").[159] The purpose of the grants is to "provide decent housing and a suitable living environment and expand economic opportunities, principally for persons of low and moderate income."[160] HUD awards grants to entitlement communities and these communities choose how to spend the funds in ways that best serve the needs of the community.[161] Seventy percent of the funds must be used to benefit low and moderate income people, and the grantees must use the funds to serve one of the program's broad national objectives.[162] Furthermore, CDBG funds can be used for one of

157 *See* State Hazard Mitigation Plan, *supra* note 140, at 199-200.

158 *Id.* at 202 (the Massachusetts Mitigation Grants Administrative Plan can be found in Appendix 10 of the 2010 State Hazard Mitigation Plan).

159 Title I of the Housing and Community Development Act, 42 U.S.C. § 5301(c); U.S. Department of Housing and Urban Development, Community Planning & Development, Community Development Block Grant Entitlement Communities Grants, http://www.hud.gov/offices/cpd/communitydevelopment/programs/entitlement/ [hereinafter HUD CDBG Entitlement Communities Grants] (last visited June 22, 2011)

160 *Id.*

161 *Id.*

162 These include "the elimination of slums and blight and the prevention of blighting influences," "the elimination of conditions which are detrimental to health, safety, and public welfare," providing " a decent home and

twenty-five enumerated eligible activities, including the construction and improvement of public facilities, some public services, and economic development and job creation activities.[163]

In order to receive CDBG funding, entitlement communities must submit a Consolidated Plan to HUD, which outlines the community's goals, objectives, and outcomes for the funds.[164] Cities also issue an Action Plan each year, setting forth the specific projects they will undertake and which reflect the priorities established in the Consolidated Plan.[165] HUD is promoting the use of Consolidated Plans to incorporate sustainability and adaptation-related goals into local planning and to access federal funding for these goals.[166]

The City could amend its current Consolidated Plan (in effect until 2013) or develop its next Consolidated Plan with a goal of identifying and accessing federal funds for reducing vulnerability to climate change in low-income neighborhoods of the City (as it has done for climate mitigation related to energy efficiency and green collar jobs).[167] For example, the City could consider building on programs such as Grassroots (a community garden program) to provide green infrastructure, improve stormwater management, and pursue other measures to mitigate the urban heat island effect in such communities. Alternatively, the City might also be able to access funding from other programs, such as HOME, to build or rehabilitate affordable housing that is designed to withstand the future impacts of flooding or heat waves.

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a suitable living environment," and "the alleviation of physical and economic distress through the stimulation of private investment and community revitalization in areas with population outmigration or a stagnating or declining tax base." 42 U.S.C. § 5301(c); HUD CDBG Entitlement Communities Grants, *supra* note 159.

163 42 U.S.C. § 5305; HUD CDBG Entitlement Communities Grants, *supra* note 159.

164 *See* HUD CDBG Entitlement Communities Grants, *supra* note 159.

165 24 C.F.R. § 91.320.

166 For example, Greensboro, North Carolina is using CDBG funds to "promote Greensboro's green infrastructure and equitable access to open space," as well as to "continue to implement recommendations on 'Cool Cities' initiatives." City of Greensboro and Guilford County Consolidated Plan 2010-2014: Plan for a Resilient Community 83 (Aug. 2, 2010), *available at* http://www.greensboro-nc.gov/NR/rdonlyres/79978619-63EB-493D-81F4-7C8E5D056130/0/GSO_ConPlan_2010_14.pdf.

167 Amendments are subject to a citizen participation process, which is set out in each jurisdiction's consolidated plan. *See* 24 C.F.R. § 91.505.

### C. BWSC User Fees

**Legal authority**: existing municipal authority

**Type of development**: n/a

**Option:** The BWSC can co-finance maintenance of green infrastructure with the City through user fees.

The BWSC could co-finance construction and maintenance of green infrastructure with the City. As explained in Section 3C, the BWSC has broad discretion under both its enabling act and its own guidelines to set user fees.[168] Furthermore, the BWSC has broad authority to make improvements to the water and sewer systems and to finance those improvements with revenues.[169] With this authority the BWSC has used revenues to control and limit stormwater flows. For example, the BWSC has implemented the downspout disconnection program, by which it funds the disconnection of residential downspouts that discharge into municipal storm drains.[170] Likewise, the BWSC could collaborate with the City to fund the construction and maintenance of green infrastructure projects, such as green roofs and the creation of pervious green spaces. Green infrastructure projects increase the rate of groundwater infiltration and thereby decrease the demand on stormwater systems.[171] Implementation of these projects, therefore, falls within the BWSC's statutory authority to manage stormwater.

In addition to stormwater benefits, green infrastructure is important to the maintenance of a healthy water supply. By increasing the amount of groundwater infiltration, green infrastructure helps to retain surface water flows, which are dependent, in part, upon groundwater levels. Green infrastructure also enhances water quality. By infiltrating precipitation close to its source, green infrastructure reduces the transport of pollutants to nearby surface waters and allows for the natural removal of pollutants by soils, plants and microbes during the infiltration process.[172] Although the BWSC has not yet relied upon these benefits to the water supply as a basis for promoting groundwater infiltration,[173] they lend further support to the BWSC's authority to fund green infrastructure

168 *Supra* note 133.

169 1977 Mass. Acts Ch. 436, § 7.

170 *See* BWSC, Downspout Disconnection Program, *available at* http://www.bwsc.org/SERVICES/Programs/downspout.pdf.

171 *See* EPA, How Does Green Infrastructure Benefit the Environment?, http://cfpub.epa.gov/npdes/home.cfm?program_id=298#benefit (last visited July 21, 2011).

172 *Id*.

173 The BWSC has expressed the opinion that it does not have authority regarding groundwater infiltration. Discus-

projects within the City.

sion with John Sullivan, Chief Engineer, BWSC (Sept 16, 2010).

# 5. CONCLUSION

We confronted several challenges in developing the list of options presented here. First, the absence of methods for measuring the (avoided) costs and benefits of different options made it difficult to prioritize potential options or to highlight the tradeoffs between different adaptation measures. Second, many of the adaptation measures proposed for other communities are designed for small communities that are making decisions about the location and character of their future (green-fields) development. As a result, the range of policy options focuses overwhelmingly on measures for improving the resilience of new development, rather than for addressing existing development. These options are less useful to a large, developed city like Boston, which is challenged to adapt a substantial amount of existing development to the future impacts of climate change. Boston has an opportunity to be a pioneer in this area. While many of the options discussed in this paper are being discussed elsewhere, few large cities have implemented significant adaptation measures. Boston can, therefore, be a leader in the U.S. and internationally as it moves forward with proactive implementation of adaptation measures.

# APPENDIX A: DETAILED LEGAL ANALYSIS OF POTENTIAL CONSTITUTIONAL CHALLENGES

This section provides a more detailed analysis of potential Constitutional challenges to the floodplain regulation amendments discussed in Section 2E.

### (1) Equal Protection Challenges

Rezoning certain parcels to include flood control protections could conceivably be challenged as "spot zoning." "Spot zoning occurs when there is a singling out of one lot for different treatment from that accorded to similar surrounding land indistinguishable from it in character, all for the economic benefit of the owner of that lot."[174] Spot zoning "constitutes a denial of equal protection under the law guaranteed by State and Federal Constitutions."[175] Massachusetts courts have upheld zoning amendments against allegations of spot zoning when the municipality can show that the parcel has been treated similarly to like parcels or that it has been treated differently from other parcels based on legitimate physical differences. For example, in a reverse spot zoning case, the Massachusetts Court of Appeals upheld the rezoning of a parcel from a light industrial district to a flood conservancy zone. The court found that the parcel differed from the surrounding area because it was covered with waterways important for flood control and that other flood-prone parcels not rezoned for inclusion within the flood conservancy zone were already subject to agricultural preservation restrictions that had the same effect.[176]

The extension of existing floodplain regulations to new areas identified on a city-developed map as prone to future flooding is likely to withstand an equal protection challenge. The current regulations apply different zoning restrictions to areas of land based on their relative vulnerability to

174 *Van Renselaar v. City of Springfield*, 787 N.E.2d 1148, 1152 (Mass. App. Ct. 2003)(citation and internal quotation marks omitted); *see also National Amusements v. City of Boston*, 560 N.E.2d 138, 142 (Mass. App. Ct. 1990) ("[U]nder our cases zone changes which have no roots in planning objectives but which have no better purpose than to torpedo a specific development on a specific parcel are considered arbitrary and unreasonable. The vice is the singling out of a particular parcel for different treatment from that of the surrounding area, producing, without rational planning objectives, zoning classifications that fail to treat like properties in a uniform manner.").

175 *Rando v. Town of N. Attleborough*, 692 N.E.2d 544, 546 (Mass. App. Ct. 1998) (citations omitted). The standard for equal protection analysis under the state Declaration of Rights is the same as under the federal Fourteenth Amendment. *Cote-Whitacre v. Dep't of Pub. Health*, 844 N.E.2d 623, 640 n.15 (Mass. 2006). Spot zoning is also illegal on statutory grounds because it violates the "uniformity" requirement of the Zoning Enabling Act. *Rando*, 692 N.E.2d at 546.

176 *Andrews v. Town of Amherst*, 862 N.E.2d 65, 70-74 (Mass. App. Ct. 2007); *see also Fabiano v. City of Boston*, 730 N.E.2d 311, 314-316 (Mass. 2000) (holding that the rezoning of one row of houses within a historic district to preclude commercial development was not spot zoning because the row had historically been used differently than other houses within the district).

flooding.[177] With an updated map, the City would differentiate among parcels based on their relative risk of future flooding. For example, the City might apply different regulations to parcels within the current 100-year floodplain than those within the future 100-year floodplain. By treating different parcels differently and similar parcels similarly, the City's regulations should survive any equal protection challenges.

### (2) Takings Claims

The adoption of more extensive and more stringent flood control requirements could also be challenged as a taking that requires just compensation. The Takings Clause of the Fifth Amendment provides that private property shall not "be taken for public use, without just compensation."[178] "[T]he Takings Clause 'does not prohibit the taking of private property, but instead places a condition on the exercise of that power.'"[179] Federal case law defines four basic categories of government action that constitute a taking under the Fifth Amendment,[180] two of which are relevant to takings challenges to floodplain zoning amendments. First, regulations that deprive the property owner of all economically beneficial use constitute a *per se* taking.[181] To demonstrate a *per se* regulatory taking, "a plaintiff must demonstrate that the challenged regulation leaves 'the property economically idle' and that she retains no more than a 'token interest.'"[182] Second, other regulations, which may be significant, but do not deprive the property owner of all economically beneficial use, are governed by a three-factor test established by the U.S. Supreme Court in *Penn Central Transportation Co. v. New York City*.[183] Under *Penn Central*, the Court considers (i) "the economic impact of the regulation," (ii) "the extent to which the regulation has interfered with distinct investment-backed expectations," and (iii) the "character of the government action."[184]

177 *See* Boston, Mass., Zoning Code, art. 25

178 U.S. Const. amend. V. The takings clause applies to the states via the Fourteenth Amendment. *Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 122 (1978). In addition, the Massachusetts Constitution has a similar provision. Mass. Const. Pt. 1, Art 10. The Massachusetts takings provision has, thus far, been held "to provide property owners the same protection afforded under the just compensation clause of the Fifth Amendment" and Massachusetts courts follow federal takings analysis in evaluating the effect of a regulation on property rights. *Blair v. Dep't of Conservation and Rec.*, 932 N.E.2d 267, 274-275 (Mass. 2010).

179 *Lingle v. Chevron U.S.A., Inc.*, 544 U.S. 528, 536 (2005) (quoting *First Evangelical Lutheran Church of Glendale v. County of Los Angeles*, 482 U.S. 304, 314 (1987)).

180 *Id*. at 548.

181 *See Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1019 (1992).

182 *Gove v. Zoning Bd. of Appeals of Chatham*, 831 N.E.2d 865, 872 (Mass. 2005) (quoting *Palazzolo v. Rhode Island*, 533 U.S. 606, 631 (2001)).

183 *See Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104 (1978)

184 *Id*. at 124.

The regulations discussed here—an expansion of current floodplain regulations to reflect both the current and the future potential for flooding and the restriction of vulnerable ground-floor uses within areas subject to future flooding—should not constitute a taking. First, both regulations would survive a facial challenge because they include exceptions and variances. In *Blair*, the court rejected a facial attack on a zoning regulation that included exceptions and variance provisions because, it explained, "[a] statute does not, on its face, effect an unconstitutional taking when there are any circumstances in which an owner retains an economically viable use of his or her own property.[185] The floodplain regulations currently in effect, which would be expanded to apply to areas subject to future flooding, do not prohibit all types of development and contain exceptions and variance provisions. Likewise, the imposition of limitations on ground floor uses would not preclude all development on a parcel.

Second, the regulations should probably also survive an as-applied challenge, though it is harder to provide a definitive answer given the fact-specific nature of such cases. Regulatory takings challenges, particularly under *Penn Central*, require a searching factual inquiry.[186] In *Gove*, for example, the Supreme Judicial Court rejected a takings challenge to the Chatham Zoning Board's denial of a residential building permit pursuant to an amended zoning regulation. The Court considered a number of factors, including that Gove had not shown any substantial personal financial investment in the property; had attempted unsuccessfully to sell the property prior to the regulation at issue; and that the property retained some allowed uses and some value, though significantly reduced.[187] It is conceivable that the facts of a given situation could be sufficiently different to yield a contrary result. In fact, the court in *Gove* suggested that certain circumstances, such as "where a bona fide purchaser for value invested reasonably in land fit for development, only to see a novel regulation destroy the value of her investment," could give rise to a successful takings claim.[188]

Nevertheless, courts have generally been inclined to reject takings challenges to floodplain regulations, and it is unlikely that the regulations proposed here would fare any worse. In *Gove*, the Court explained that floodplain regulations are "the type of limited protection against harmful private

185 *See Blair*, 932 N.E.2d at 272 (rejecting a facial attack on a zoning regulation that included exceptions and variance provisions).

186 *See Tahoe-Sierra Preservation Council, Inc. v. Tahoe Regional Planning Agency*, 535 U.S. 302, 302-303 (2002) ("Although this Court's physical takings jurisprudence, for the most part, involves the straightforward application of *per se* rules, its regulatory takings jurisprudence is characterized by essentially ad hoc, factual inquiries" designed to allow "careful examination and weighing of all the relevant circumstances.")(internal citations omitted).

187 *Gove*, 831 N.E.2d at 873-875.

188 *Id*. at 874-875.

land use that routinely have withstood allegations of regulatory takings."[189] Thus, even under the circumstances presented in that case—where the property was no longer eligible for residential development and had decreased in value from an estimated $346,000 to $23,000—the court upheld application of the floodplain regulations.[190] It is likewise hard to imagine that the extension of the City's current floodplain regulations to the future floodplain or the reasonable restriction of vulnerable ground floor uses would constitute a regulatory taking requiring just compensation. Property owners in both situations would retain more than a token interest and, in the latter case, would be deprived of only one potential use of the ground floor of their property. That, coupled with the well-documented risks of sea level rise and increased coastal flooding, suggests that a court would likely uphold the amended floodplain regulations as permissible protections against harmful land use that do not require the payment of just compensation.

### (3) Due Process

Constitutional challenges may also arise under the Due Process clause.[191] Pursuant to the due process clause a regulation is invalid if it does not legitimately advance a state interest. Thus, to be proper a regulation must be "effective in achieving some legitimate public purpose."[192] This is a "highly deferential test" that "neither involves heightened scrutiny nor allows a court to question the wisdom of an ordinance."[193] Courts afford municipalities "great latitude in making decisions about the extent of areas to be burdened with zoning restrictions" and uphold zoning boundary choices where there is evidence in the record to support the choice.[194] For example, in *Andrews*, the Court of Appeals held that the extension of a town's flood protection conservancy zone was legitimate when on at least one occasion the area had been flooded and was traversed by waterways.[195] Here, as discussed in the text, there is abundant evidence indicating that the current floodplain maps are inadequate to account for future flood risks. As a result, rezoning and the imposition of

189 *Id.* at 875.

190 *Id*. at 874-875.

191 The Fourteenth Amendment of the United States Constitution provides "nor shall any State deprive any person of life, liberty, or property, without due process of law." U.S. Const. amend. XIV, § 1. The Massachusetts Bill of Rights likewise provides that "no subject shall be arrested, imprisoned, despoiled, or deprived of his property, immunities, or privileges, put out of the protection of the law, exiled, or deprived of his life, liberty, or estate, but by the judgment of his peers, or the law of the land." M.G.L.A. Const. Pt. 1, Art. 12. In evaluating due process challenges, Massachusetts courts have adhered to the same standards as apply in federal due process analysis. *Commonwealth v. Ellis*, 708 N.E.2d 644, 649-651 (Mass. 1999).

192 *Lingle v. Chevron U.S.A., Inc.*, 544 U.S. 528, 542 (2005).

193 *Gove*, 831 N.E.2d at 870-871.

194 *Andrews*, 862 N.E.2d at 70-72.

195 *Id.*

additional regulations should be upheld as achieving a legitimate public purpose.

The due process clause also prohibits regulations that are unconstitutionally vague.[196] In the context of the regulations proposed here, this could become an issue with regard to the delineation of new floodplain boundaries. For example in *Beechwood Acres, Inc. v. Town of Hamilton*, the Supreme Judicial Court upheld zoning maps as providing "reasonable accuracy," but explained that:

> [a] definition of the zone boundary by metes and bounds would have been more satisfactory than merely showing it upon the zoning maps included among the exhibits. Use of small scale maps, without very precise definition of zone boundaries in the by-law itself, obviously is likely to lead to misunderstanding and controversy.[197]

Any ambiguity regarding the boundaries of a zoning map will likely be resolved in favor of a property owner.[198] As such, the City should be careful to adopt a map and a description of boundaries that is clear and well-defined.

196 *See, e.g., Donovan v. City of Haverhill*, 311 F.3d 74, 77 -78 (1st Cir. 2002); *see also U.S. v. Williams*, 553 U.S. 285, 304 (2008) (stating that the "vagueness doctrine is an outgrowth not of the First Amendment, but of the Due Process Clause of the Fifth Amendment").

197 *Beechwood Acres, Inc. v. Town of Hamilton*, 216 N.E.2d 94, 96 (Mass. 1966) (citation omitted).

198 *See, e.g., Jenkins v. Town of Pepperell*, 465 N.E.2d 268, 272 (Mass. App. Ct. 1984) (holding that where a zoning map is subject to multiple interpretations, the proper remedy "is not invalidation of the zoning, but rather the fixing of the boundary in accordance with the interpretation most favorable to the landowner").

# APPENDIX B: DETAILED ANALYSIS OF THE LEGALITY OF IMPACT FEES

This section provides a more detailed analysis of the legal limitations on the City's ability to charge impact fees to finance green infrastructure as mentioned in footnote 167.

The City will not be able to use impact fees to finance green infrastructure. Under the Massachusetts Home Rule Amendment, municipalities can assess fees associated with municipal functions (i.e. user fees), but they may not assess taxes.[199] Massachusetts courts use a three-part test developed in *Emerson College v. City of Boston* to distinguish between valid municipal fees and impermissible taxes.[200] Pursuant to this test, fees must be: 1) charged in exchange for a particular governmental service which benefits the party paying the fee in a manner not shared by other members of society; 2) paid by choice with the option of not utilizing the governmental service and thereby avoiding the charge; and 3) collected to compensate the governmental entity providing the services for its expenses, not to raise revenues.[201]

Although municipal impact fees are often held to be unconstitutional taxes,[202] they may be upheld if they have a particularized benefit for the assessed party. For example, Massachusetts courts have generally upheld the constitutionality of municipal fees assessed by sewer commissions or electric companies for new users, on the theory that the new user is gaining a benefit that is not shared with existing users of the system. For example, in *Bertone v. Department of Public Utilities*, the court held that a fee for new users to hook up electricity was permissible because the advantages of the new infrastructure benefited the new users, and old users did not experience any changes in service.[203] On the other hand, in *Berry v. Danvers*, the court distinguished *Bertone* and held that a fee for new users of the sewer system was unconstitutional because the sewer system had been inadequate for years and the funds were to "repair problems inherent in the existing system" rather than accommodate new users.[204]

199 *See* Mass. Const., amend. art. 2 § 6; Mass. Const. amend. art. 89 § 7.

200 *Emerson College v. City of Boston*, 462 N.E.2d 1098, 1104-1107 (Mass. 1984); *see also* Lawrence Friedman & Eric W. Wodlinger, *Municipal Impact Fees in Massachusetts*, 88 Mass. L. Rev. 131, 136 (2004) (explaining that the Massachusetts test is much stricter than the "dual rational nexus" analysis used by many other states to determine whether a municipal assessment is constitutional).

201 *Emerson College*, 462 N.E.2d at 1104-1107.

202 *See, e.g., Greater Franklin Developers Ass'n v. Town of Franklin*, 730 N.E.2d 900, 902-903 (Mass. App. Ct. 2000) (holding school impact fee assessed on new or expanded residential buildings in order to expand its school system in response to increased development unconstitutional because the improved school system benefited all community members and the town had an obligation to provide schools from the general fund).

203 *Bertone v. Department of Public Utilities*, 583 N.E.2d 829 (Mass. 1992); *see also Town of Winthrop v. Winthrop Housing Authority*, 541 N.E.2d 582 (Mass. App. Ct. 1989) (holding that a fee to connect to the common sewer system was constitutional because it primarily benefited the new users, the users had a choice whether to connect, and there was a reasonable relationship between the fee and its use).

204 *Berry v. Danvers,* 613 N.E.2d 108, 110-112 (Mass. App. Ct. 1993).

Courts have also typically upheld fees assessed by regulatory agencies that may benefit the public at large, but allow the assessed party to obtain some particularized economic benefit. For example, in *Baker v. Department of Environmental Protection*, the court upheld a fee for filing a notice of intent to develop wetlands under the Wetlands Protection Act.[205] The court reasoned that although the protection of wetlands benefits the public as a whole, the developer would eventually reap a financial benefit from developing the wetlands and should, therefore, in exchange pay the government's costs associated with protecting the wetlands from adverse development.[206] Similarly, in *Nuclear Metals, Inc. v. Low-Level Radioactive Waste Management Board*, the court held that the Board's fee assessed on waste companies to defray costs was constitutional because the companies received the particularized benefit of access to the proper waste facilities.[207] The court explained that "while the safe disposal of low level radioactive waste is a public benefit, it is the plaintiff (and not the general public) which requires access to disposal facilities."[208]

An impact fee on new development to raise funds for acquiring and maintaining green space on public streets and squares would likely be characterized as an impermissible tax. First, all members of the public—not just those living or working in new developments—enjoy green space on public streets and squares.. Furthermore, the benefits of better stormwater management, such as decreased sewer rates, better water quality, and less flooding will be shared by everyone in the City. Second, while developers and potential buyers can choose to build or live in a different city, and therefore have a choice of whether to pay the fee, courts have held that this factor alone is not conclusive.[209] Third, under state law the City has an obligation to maintain sidewalks, streets, and open space, and therefore a court is likely to find that acquisition and maintenance should be paid for out of the general fund.[210] In sum, as a legal matter, the City will not be able to assess impact fees in order to fund the development of green infrastructure.

205 *Baker v. Department of Envtl. Protection*, 657 N.E.2d 480 (Mass. App. Ct. 1995).

206 *Id.* at 481-482.

207 *Nuclear Metals, Inc. v. Low-Level Radioactive Waste Management Bd.*, 656 N.E.2d 563 (Mass. 1995).

208 *Id.* at 569 (citation omitted).

209 *Greater Franklin Developers Ass'n*, 730 N.E.2d at 902-903.

210 In Massachusetts, municipalities are responsible for maintaining roads, sidewalks, and green areas built between the sidewalk and street bed. *See* M.G.L. c. 84, § 1 ("Highways and town ways . . . shall be kept in repair at the expense of the town in which they are situated, so that they may be reasonably safe and convenient for travelers."); M.G.L. c. 83, § 25 ("The aldermen of a city or the selectmen or road commissioners of a town may, if in their judgment the public convenience so requires, establish sidewalks in the public ways thereof and determine the grade of each such sidewalk and the materials with which it shall be constructed, and may order the reconstruction of existing sidewalks."); *Vellante v. Watertown*, 14 N.E.2d 955, 956 (Mass. 1938) (noting that a city fulfills its duties under chapter 84 if it "keeps its ways 'reasonably' safe and convenient," in a case where the "way" at issue was a sidewalk); M.G.L. c. 82, § 34 (authorizing municipalities to "reserve spaces between the side lines [of highways and town ways] for the use of horseback riders, for bicycle paths or for street railways, except such as may be operated by steam, for drains, sewers and electric wires, for trees and grass, and for planting"). In Boston, general maintenance and repair of roads and sidewalks are the responsibility of the Highway Maintenance Division. City of Boston, Roadway and Sidewalk Cleanliness and Temporary Repair, http://www.cityofboston.gov/publicworks/cleanliness (last visited July 22, 2011).


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**The Emmett Environmental Law & Policy Clinic** at Harvard Law School is directed by Wendy B. Jacobs and is dedicated to addressing major environmental issues in the United States and abroad and to providing its students an opportunity to do meaningful, hands-on environmental legal and policy work. Students and clinic staff work on issues such as climate change, pollution reduction, water protection and smart growth.