

June 2021

Confronting Coastal Flood Risks in Portland, ME

Katherine C. Skinner
University of Maine School of Law

Follow this and additional works at: <https://digitalcommons.maine.law.maine.edu/oclj>



Part of the [Law Commons](#)

Recommended Citation

Katherine C. Skinner, *Confronting Coastal Flood Risks in Portland, ME*, 26 *Ocean & Coastal L.J.* 155 (2021).

Available at: <https://digitalcommons.maine.law.maine.edu/oclj/vol26/iss2/4>

This Comment is brought to you for free and open access by the Journals at University of Maine School of Law Digital Commons. It has been accepted for inclusion in *Ocean and Coastal Law Journal* by an authorized editor of University of Maine School of Law Digital Commons. For more information, please contact mdecrow@maine.edu.

CONFRONTING COASTAL FLOOD RISKS DUE TO CLIMATE CHANGE IN PORTLAND, MAINE

Katherine C. Skinner

INTRODUCTION

- A. Portland's Dependency on Coastal Investment and Increased Risk of Flooding*
- B. Projections for Rising Sea Level in Maine*
- C. Land Use Controls and Zoning Power*

I. LAND USE MEASURES CURRENTLY IN PLACE TO PREPARE PORTLAND MAINE FOR COASTAL FLOODING

- A. The Coastal Zone Management Act and the Maine Coastal Program*
- B. Federal Emergency Management Agency Mapping*
- C. The Mandatory Shoreland Zoning Act*
- D. An Act to Help Municipalities Prepare for Sea Level Rise*
- E. Environmental Laws and Portland's Sewage Overflow System*

II. LEGAL AND ECONOMIC RESTRICTIONS TO FLOOD PREPAREDNESS

- A. Limitations on Land Use Restrictions that Impede Personal Property Rights*
- B. Economic, Psychological and Ethical Challenges to Implementing Land Use Measures in Portland*

III. RECOMMENDATIONS FOR PORTLAND

- A. Protecting Critical Habitat*
- B. Addressing Social Justice Issues*
- C. Restricting Further Development in High-Risk Areas*

CONCLUSION

CONFRONTING COASTAL FLOOD RISKS DUE TO CLIMATE CHANGE IN PORTLAND, MAINE

*Katherine C. Skinner**

Sea level rise, increasing and intensifying storms, and subsequent flooding resulting from climate change pose significant and imminent danger to coastal communities. An examination of Portland, Maine, a coastal city in New England, provides an opportunity to address challenges related to flooding concerns resulting from climate change. It also aids in considering strategies that could be helpful for other similarly situated communities.

Land use strategies can be an effective means to manage the rising flood risks, but each land use regulation change comes with its own legal, social, environmental, and economic considerations. Portland can and should develop land use regulations to limit and disincentivize further development in the highest risk areas of the city. Such action should reflect the city's social, environmental, and economic goals as weighed against the serious flooding concerns it faces.

INTRODUCTION

In as little as eighty years from now, substantial portions of coastal communities in the state of Maine may be regularly submerged by rising sea levels due to climate change.¹ In a draft report released November of 2019 by GEI Consultants, Inc. of Portland, Maine, sea level rise as a direct consequence of climate change could result in the routine submersion of parts of towns on island communities such as Stonington, a town 160 miles northeast of Portland, by the year 2100.² If sea level does increase by forty-eight inches by 2100, which is suggested in moderate projections by the National Ocean and Atmospheric Administration (NOAA), central areas

* J.D. Candidate, Class of 2021, University of Maine School of Law.

1. Nick Sambides, *A New Study Shows Where Stonington Could be Under Water in the Next 81 Years*, BANGOR DAILY NEWS (Nov. 6, 2019), <https://bangordailynews.com/2019/11/06/news/hancock/a-new-study-shows-where-stonington-could-be-under-water-in-the-next-81-years/> [<https://perma.cc/ZTV4-7R2G>].

2. *Id.*

of Stonington such as the commercial section of Main Street and the town owned Fish Pier will be subject to flooding only with mild storms.³ Though such projections represent early estimates, and may be subject to modification, the overarching picture suggested by the study underscores the urgency of addressing flood-risks in Maine’s coastal communities.

Rising sea level and increasing intensity of storms due to global climate change has become an impending crisis for coastal communities worldwide. In recent years, as global warming continues, the rate of sea level rise has accelerated.⁴ The sea level rise is due to glacier melt which adds more water to the ocean, the warming of the water which expands the volume of the ocean, and a decrease in natural water storage on land.⁵ To a certain extent, sea level rise in the future will depend on a multitude of factors such as the amount of greenhouse gas emissions and the rate of glacial melting.⁶ Predictions suggest that the sea level will rise an average of up to 6.6 feet by the year 2100.⁷ However, not all areas are subject to the same level of rise. Studies indicate that “[s]ome locations [will] experience greater rise than others because of local terrain, local hydrological factors, and oceanic currents, among other regional factors.”⁸ Unfortunately, many urban areas are situated on the coast and are especially vulnerable to the effects of sea level rise.⁹ The impacts of rising sea levels on these areas could be catastrophic and sudden.

In coastal urban communities, “rising seas threaten infrastructure necessary for local jobs and regional industries. Roads, bridges, subways, water supplies, oil and gas wells, power plants, sewage treatment plants, landfills—the list is practically endless—are all at risk from sea level rise.”¹⁰ Flooding is one of the greatest concerns resulting from sea level rise. Most predictions indicate that “the warming of the planet will

3. *Id.*

4. Rebecca Lindsey, *Climate Change: Global Sea Level*, NOAA CLIMATE.GOV (Jan. 25, 2021), <https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level> [<https://perma.cc/8C7X-U92C>].

5. *Id.*

6. Kevin Miller, *Maine Islands Face a Rising Risk from Climate Change*, PORTLAND PRESS HERALD (Sep. 18, 2019), <https://www.pressherald.com/2019/09/18/maine-islands-at-high-risk-from-climate-change/?rel=related> [<https://perma.cc/LQ5Q-26RC>].

7. Erin A. Thead, *Sea Level Rise: Risk and Resilience in Coastal Cities*, CLIMATE INSTITUTE (October 2016), <http://climate.org/sea-level-rise-risk-and-resilience-in-coastal-cities/> [<https://perma.cc/XY7S-XYPR>].

8. *Id.*

9. *Id.*

10. Lindsey, *supra* note 4.

continue and is likely to accelerate, causing the oceans to keep rising. This means hundreds of coastal cities [will] face flooding.”¹¹

Each coastal city has its own set of unique vulnerabilities to climate change. Routine tidal flooding is already causing destruction in coastal cities, “closing streets, killing plants, polluting water supplies, and making roads impassable. Inundation caused by rising sea levels is only one aspect of the looming flooding problem: climate change is also projected to increase the severity of rainstorms and hurricanes, worsening catastrophic flooding.”¹² Thus, regular risk and damage from coastal flooding is already a reality many communities face. However, the impacts and risks of the flooding are not evenly distributed for all coastal populations. In cities across the country, the potential for disaster and “[f]lood risk is disproportionately concentrated in low-income, minority communities.”¹³ Inexpensive housing is often less resistant to extreme weather and flooding.¹⁴ In addition, low income, minority communities generally “utilize public services such as buses more than other residents, and as the tragedy of Hurricane Katrina in New Orleans showed, these residents are most vulnerable in the event of a needed evacuation.”¹⁵ If not addressed, the disproportionate flood risk that these populations face will continue to exacerbate the already existing social inequalities if not addressed.

To prepare for these risks and to minimize potential damage, it is imperative to examine the ways in which people and businesses are incentivized or restricted in using coastal land. Unfortunately, “policies at all levels of government have for nearly a century encouraged coastal development in various ways...[E]xperts in planning, climate change, and disaster law have argued that government now needs to begin the process of moving people away from the areas most exposed to flood risk.”¹⁶ Zoning laws are one way that behavior in relation to use of land can be altered and shaped. However, at odds with the need to move people away from coastal risk areas is the fact that people love coastal property and many economies now depend on that. Therefore, any solution will require

11. Christina Nunez, *Sea Level Rise, explained*, NATIONAL GEOGRAPHIC (Feb. 19, 2019), <https://www.nationalgeographic.com/environment/global-warming/sea-level-rise/> [<https://perma.cc/7NFA-NNRW>].

12. Alexander B. Lemann, *Stronger Than the Storm: Disaster Law in A Defiant Age*, 78 LA. L. REV. 437, 440–41 (2018).

13. *Id.* at 444.

14. Susan Milligan, *The Forecast for Recovery*, U.S. NEWS (Sep. 21, 2018), <https://www.usnews.com/news/the-report/articles/2018-09-21/hurricanes-hit-everyone-but-the-poor-have-the-hardest-time-recovering> [<https://perma.cc/Q9MM-8REE>].

15. Thead, *supra* note 7.

16. Lemann, *supra* note 12, at 441.

a delicate balance between flood preparation and continued economic sustainability.

Particularly within the context of rising sea levels and subsequent urban flooding, coastal communities in the state of Maine are in immediate jeopardy of experiencing significant and ongoing issues related to climate change. This discussion will assess the present circumstances of Maine's coastal communities, focusing specifically on the City of Portland's current preparedness for rising sea levels and flooding concerns related to the increasing intensity of storms. Such preparedness will be examined through the lens of current federal laws and local zoning laws in place in Portland designed to assess and mitigate current flood risks. In response to such flooding concerns facing Portland, this analysis will then consider the value in, and urgency of, the implementation of certain additional land use measures in light of the potential negative economic and social impacts of those increased measures.

A. Portland's Dependency on Coastal Investment and Increased Risk of Flooding

Like many other coastal communities, Portland, Maine thrives on coastal investment and development. Almost ten years ago, Wesley Davis, in his article *Lessons Learned from the Flood Insurance Re-Mapping Controversy in Portland*, grappled with the potentially devastating economic effects of rezoning Portland into a high-risk area, completed by the Federal Emergency Management Agency ("FEMA").¹⁷ Davis explained that, for Portland Maine:

The economic importance of coastal development is indisputable. The property that runs along the Gulf and Atlantic coasts alone is valued at \$9 trillion. Much of this is attributable to giant commercial centers, derived from their mercantile past where they served as conduit points between the shipping lanes of the open ocean and the inland networks of road and rail. Not only financial health but psychological well-being is also at stake. The high economic value of coastal land is not merely about dollars and cents.¹⁸

17. Wesley Davis, *Lessons Learned from the Flood Insurance Re-Mapping Controversy in Portland, Maine*, 16 OCEAN & COASTAL L.J. 181, 197 (2010).

18. *Id.*

Davis concluded that the economic losses resulting from increased zoning measures would be far worse than the potential benefits of the additional regulations proposed by FEMA. In arguing that Portland was not truly at high risk from flood damage, Davis asserted that that coastal areas of Portland have been naturally protected from coastal flooding by the surrounding islands. Furthermore, Davis argued, Portland “has been used for centuries as a safe haven for ocean-going vessels, including oil tankers, cruise ships, and Coast Guard frigates. Minute storm damage has been reported over this time. Over the past thirty years, only three insurance claims, totaling \$36,000, have been paid out.”¹⁹ However, in the past ten years, the amount of available scientific data has increased regarding imminent global sea level rise and increasing storm intensity. As Davis asserts, it is possible that in the past, the natural barriers of the islands and the particular situation of Portland has protected the city from coastal flooding, but conditions in Maine are rapidly changing due to climate change. The importance of addressing potential flooding concerns, even at the risk of negative economic impact, is continually increasing. As sea levels rise, the balancing of economic impacts of increased zoning regulations versus the risk of potential flooding disasters tips towards the need for an increase in land use measures. Portland’s economy depends upon continued investment in coastal development and yet, many parts of Portland are barely above sea level and are already subject to flooding.

Davis also argues that land use controls are largely ineffective in preparing coastal areas for flooding risks. He asserts that the shortcomings of land use controls are a result of human nature in relation to property rights because “[l]and use controls involve the unnatural human trade-off of economic sacrifices today for unknown benefits at some unknown future time. While advance action is the reason mitigation can be so effective, it is also the reason why mitigation is so difficult to implement.”²⁰ However, the very purpose and result of land use controls is often to force the population to internalize the externalities of their property.²¹ This means that land use measures force property owners to consider potential risks of their property that may not currently and directly affect the interest of the individual property owner. For example, environmental zoning ordinances that contain certain building restrictions to protect natural resources cause the property owner, and subsequent purchasers, to consider those restrictions in developing their plans for the

19. *Id.* at 181–82.

20. *Id.*

21. See Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV., 347 (1967).

property or in determining its value. In addition, creating more zoning ordinances will affect the collective psychology of the population. People will be reminded that flooding or other environmental concerns are real and immediate problems we are all facing. Due to Portland's history of relatively low flood concerns, it is probable the population underestimates future risks and is not be mentally prepared for how to deal with these types of disasters.

Like Portland, Boston, Massachusetts is an historic port city on the Atlantic coast of northern New England. Hurricanes have historically not been a frequent problem for New England.²² However, predictions suggest that New England is likely to be struck by "more frequent and more powerful hurricanes in the future due to shifting weather patterns."²³ Setting aside the fact that city structures may not be ready for increased flooding, residents of northern New England may not be mentally prepared. Brian Swett, formerly the chief of Boston's Department of Environment and a lead developer of Boston's climate plan explained:

If I told somebody, even in July, that we're expecting 20 inches of snow in two days, everybody has that mental checklist up here in Boston: Make sure I know where the shovel is; I know the streets not to park on because there'll probably be a parking ban; I got my bread and my milk; I've got salt for the walkway. We don't have that mental checklist up here for hurricanes and we certainly don't drill for it [...].²⁴

As in Boston, residents of Portland, Maine have experienced many years of harsh winters to learn how to deal with the effects; only recently have Mainers begun to consider how to address the effects of hurricanes and flooding.

B. Projections for Rising Sea Level in Maine

In 2016, the Environmental Protection Agency ("EPA") reported that, with regard to rising temperatures in the last century, "Maine has warmed

22. Michael Graw, *Only Eight Hurricanes Hit New England in 100 years. Soon More Will Head for Boston*, MASSIVE SCIENCE (Nov. 6, 2017), <https://massivesci.com/articles/climate-change-more-hurricanes-new-york-boston/> ("Only eight hurricanes in the last century have made landfall on the New England coast.") [<https://perma.cc/G6ZH-LF4B>].

23. *Hurricane Risk to Northeast USA Coast Increasing, Research Warns*, DURHAM U. (Nov. 23, 2016), <https://phys.org/news/2016-11-hurricane-northeast-usa-coast.html> [<https://perma.cc/6HJJ-WKG8>]; see also Graw, *supra* note 22.

24. Thead, *supra* note 7.

twice as much as the rest of the contiguous 48 states.”²⁵ This is because “[t]he Gulf of Maine’s location at the meeting point of two major currents, as well as its shallow depth and shape, makes it especially susceptible to warming.”²⁶ Studies show that the Gulf of Maine is warming faster than 99% of the rest of the ocean.²⁷ The rise in temperature and changing weather patterns mean Maine will likely experience increased flooding and droughts.²⁸ The rate of sea level rise in the Gulf of Maine and along the Maine coastline has already accelerated in the last ten years.²⁹ The accelerated sea level rise, and increased flooding risk compounded with the risks from increasingly severe storm surges on the coast necessitate migration away from coastal risk areas. Maine would not need to abandon use of all of its valuable coastland, rather Maine should work to replace coastal land uses in high-risk areas with uses more able to withstand the potential impacts of flooding. Maine needs to create strategic development plans that incentivize vulnerable types of uses away from the front lines.

The reality of these issues facing Maine has been increasingly publicized over the last few years. *The Portland Press Herald*, Maine’s largest daily newspaper, explained in a recent article published in September 2019, that Maine’s “[c]oastal communities and islands already are experiencing the impacts from a changing climate. Commercial fishermen are seeing fish populations shift or species change as the waters of the Gulf of Maine warm.”³⁰ In addition, “[m]any towns are experiencing more frequent flooding in low-lying areas, which will only worsen as sea levels rise and more severe storm surges pound the coast.”³¹ Maine is facing the flooding of roads, particularly near the coast, which could

25. Env’t Prot. Agency, *What Climate Change Means for Maine*, (Aug. 2016), <https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-me.pdf> [<https://perma.cc/S4XD-ZSYG>].

26. Laura Poppick, *Why Is the Gulf of Maine Warming Faster Than 99% of the Ocean?*, *Eos* (Nov. 12, 2018), <https://eos.org/features/why-is-the-gulf-of-maine-warming-faster-than-99-of-the-ocean> [<https://perma.cc/6HDD-55RH>].

27. *Id.*

28. Env’t Prot. Agency, *supra* note 25.

29. *Maine Coastal Plan: Strategic Outlook 2016-2020*, MAINE COASTAL PROGRAM 1, 13 (Oct. 9, 2015), <https://coast.noaa.gov/data/czm/enhancement/media/me309-2016.pdf> [<https://perma.cc/S4HT-UJ5W>].

30. Kevin Miller, *As Sea Levels Rise, Coastal Communities Grapple with Cost of Adapting*, PORTLAND PRESS HERALD (Sep. 27, 2019), <https://www.pressherald.com/2019/09/27/as-sea-levels-rise-coastal-communities-grapple-with-how-to-pay-to-adapt/> [<https://perma.cc/CR92-Y5H7>].

31. *Id.*

prevent access to businesses and homes.³² Harpswell, Maine has several coastal roads that are at serious risk of flooding and provide the only access to over 100 homes.³³ A recent study found that “Maine, New Hampshire, and South Carolina are developing risk zones faster than safer locations.”³⁴ In other words, new homes are being constructed in high-risk areas.

Portland, Maine, which is the most populated city in the state, is located on a peninsula in Casco Bay on the Gulf of Maine and the Atlantic Ocean. There are some areas of Portland that are less than four meters above sea level.³⁵ An article from 2015 notes that:

Flooding has been a problem for decades in Bayside and other areas of Portland, including near the Commercial Street piers. . . . But despite growing commercial development in Bayside in the area adjacent to Back Cove, the city has yet to take aggressive steps to address the flooding or adapt to the reality that water levels are rising in the Gulf of Maine.³⁶

The bayside area used to be a part of tidal marshes of Back Cove but was filled with gravel after the Great Fire of 1866.³⁷ Bayside and the public housing development known as Kennedy Park has been historically populated by minority and lower income communities.³⁸ The East Bayside

32. Web Mapping Tool of Maine, COASTAL RESILIENCE MAINE, <https://maps.coastalresilience.org/maine/#> (last visited Apr. 4, 2020) [<https://perma.cc/FH8F-KTNV>].

33. Kathleen O’Brien, *Harpswell Sees Roads, A Bridge at Risk as Sea Levels Rise*, PORTLAND PRESS HERALD (Sep. 27, 2019), <https://www.pressherald.com/2019/09/27/harpswell-sees-roads-at-risk-in-face-of-rising-seas/?rel=related> [<https://perma.cc/5FJR-JSLR>].

34. *Ocean at the Door: New Homes and the Rising Sea*, CLIMATE CENTRAL (July 30, 2019), <https://www.climatecentral.org/news/ocean-at-the-door-new-homes-in-harms-way-zillow-analysis-21953> [<https://perma.cc/FXV8-2HW5>].

35. *Impact of Sea Level Rise on Portland, Maine*, NATURAL RESOURCE COUNCIL OF ME., <https://www.nrcm.org/wp-content/uploads/2013/10/portland1.jpg> [<https://perma.cc/579A-49HE>]; *Topographic Map of Commercial St., Portland, ME*, WORLDWIDE ELEVATION MAP FINDER, http://elevation.maplogs.com/poi/35_commercial_st_portland_me_usa.275494.html (last visited Apr. 4, 2020) [<https://perma.cc/UNK9-MD2S>].

36. Kevin Miller, *As Sea Levels Rise, No Fix for Portland’s Flood-Prone Bayside*, PORTLAND PRESS HERALD (Oct. 2, 2015), <https://www.pressherald.com/2015/10/02/as-sea-levels-rise-no-fix-for-portlands-flood-prone-bayside/> [<https://perma.cc/G53A-3SHG>].

37. *Id.*

38. Candace Kanés, *Urban Renewal, Urban Removal*, ME. HISTORY ONLINE, <https://www.mainmemory.net/sitebuilder/site/859/page/1269/display> [<https://perma.cc/M684-654B>]; Alan Holt, *East Bayside: Creating a Sustainable Vision for Maine’s Most Diverse Neighborhood*, PORTLAND ME.,

area of Portland “is the city’s most diverse and urban neighborhood in the State’s most diverse and urban city. While Portland has been lauded widely for an enviable quality of life, unfortunately the East Bayside neighborhood has faced persistent environmental, social, and economic challenges, and until recently, has largely been neglected.”³⁹ The risk of flood damage to Portland, and the social justice issues arising from disproportionate risk affecting the most vulnerable population, requires immediate action to mitigate these risks. One lens through which to view potential responses to these issues is that of legal land use controls and zoning law.

C. *Land Use Controls and Zoning Power*

Land use law can be an efficacious tool to change human behavior in relation to land and to alter the structure of communities. Through changing behavior and the structure of communities, we can better prepare for sea level rise and more intense storms by actively and strategically distributing the risks of flooding. Inherently, “flooding is a rather spatially contained threat as certain areas are much more likely to flood than others.”⁴⁰ Thus, tactics to address flood concerns will center around how to utilize flood risk space and non-flood risk space in a way that would more evenly distribute risk overall to the community. In his article, *Disaster Mitigation Through Land Use Strategies*, John R. Nolon explains that many local governments have been delegated the legal authority from state governments “to determine what type of development may be built within their jurisdictions, including disaster-prone areas. . . . Using this authority, local governments can create disaster-resilient communities that have increased capacity to adapt to the effects of natural disasters, resulting in less property damage, environmental impact, and loss of life.”⁴¹ Such adaption and preparation of communities by local governments can be achieved, at least in part, through land use law.

Land use law “traditionally has been embodied in state enabling legislation for zoning and subdivision ordinances which have authorized

<http://www.portlandmaine.gov/DocumentCenter/View/2923/East-Bayside?bidId=/https://perma.cc/2XFZ-JMJ2>].

39. Holt, *supra* note 38.

40. *How Can Zoning Limit Flood Damage?*, ADVANCED SCIENCE NEWS (Oct. 15, 2019), <https://www.advancedsciencenews.com/how-zoning-can-limit-flood-damage/> [https://perma.cc/24Z5-D8SC].

41. John R. Nolon, *Disaster Mitigation Through Land Use Strategies*, 37 ELR 10681, 10683 (2007).

action by the municipalities and localities rather than by the state itself."⁴² This delegation allows towns to address the specific zoning needs of their communities. Thus, the strategies and goals for implementing zoning laws are necessarily tailored to particular communities. Standard zoning laws cannot be generally applied across the country to solve these issues, rather the nature of sea level rise and flooding challenges necessitate an ad hoc approach.

Zoning is a legal process that results in “[t]he legislative division of a region, [especially] a municipality, into separate districts with different regulations within the districts for land use, building size, and the like.”⁴³ Zoning laws restrict the manner in which land may be utilized in order to maintain efficient use of land and preserve property values. Furthermore, zoning laws are “designed to promote the health, safety, morals, and general welfare of the inhabitants of such areas.”⁴⁴ Zoning is an essential tool to plan and maintain prosperous communities. Typical zoning codes “define[] permitted and sometimes conditional uses, as well as building size and density of population restrictions, for each category or zoning classification. Usually, zoning ordinances are enforced prospectively by building officials who review specific development plans.”⁴⁵ Unfortunately, for a long time, zoning and land use has encouraged development in coastal areas that pose risks to property owners. Historically, “[z]oning laws often have allowed landowners to build in coastal areas and floodplains that are now at heightened risk for hurricanes and other extreme weather events, but this trend can be reversed.”⁴⁶ Going forward, “local governments that regulate the placement and, in some respects, design aspects of building stock and other infrastructure have an opportunity to avoid locking in development and infrastructure that increases flood and other climate-related risks.”⁴⁷

42. 5 TREATISE ON ENVIRONMENTAL LAW § 10.03 (2019).

43. Jesse Reiblich, Lisa M. Wedding & Eric H. Hartge, *Enabling and Limiting Conditions of Coastal Adaptation: Local Governments, Land Uses, and Legal Challenges*, 22 OCEAN & COASTAL L.J. 156, 168-69 (2017) (quoting *Zoning*, BLACK’S LAW DICTIONARY 4991 (8th ed. 2004)).

44. *City of Richmond v. Bd. of Supervisors of Henrico Cnty.*, 101 S.E.2d 641, 647 (1958).

45. Douglas W. Kmiec, *Deregulating Land Use: An Alternative Free Enterprise Development System*, 130 U. PA. L. REV. 28, 35 (1981).

46. Jessica A. Bacher & Tiffany B Zezula, *Increasing Coastal Community Resiliency through Facilitated Land Use Training, Assessment, and Amendments*, 19 No. 3 NEW YORK ZONING LAW AND PRACTICE REPORT NL 1, 1 (2018).

47. *Id.*

Thus, mechanisms exist through which local governments can begin to encourage people to move away from risk areas. There are a number of legal mechanisms through which governments can foster retreat.⁴⁸ One of the most straightforward approaches “is for local governments to ‘downzone’ flood-prone areas, proactively limiting new development on private parcels [which] can limit future development and prevent redevelopment when structures are damaged.”⁴⁹ While the burden on economic development that can result from these restrictions is highly controversial, flood zone laws restrict land use and limit development in an area in order to lessen the overall risk of disaster to the community. In addition to downzoning, implementing building code restrictions in flood zones can further reduce risk of potential flood damage.⁵⁰

One tactic to reduce flood risks in the face of increasing storm intensity is to limit or decrease the coverage of impermeable surfaces in a community. Impervious surfaces include, but are not limited to, paved highways, streets, and driveways, as well as roofs, all of which contribute to localized flooding because these surfaces prevent rainwater from seeping into the ground.⁵¹ Although decreasing the amount of impermeable surface could help with coastal flooding in developed areas, we will need to find cost-efficient permeable surfaces that can be substituted. Permeable surfaces “refer to any paving system that provides a usable hard surface but also allows for infiltration of water through the surface. Permeable pavements come in a number of different forms, with new technologies and techniques constantly being developed.”⁵² Requirements for using permeable surfaces—or at least minimizing impermeable surfaces—could be regulated by zoning and building codes. Similarly, zoning ordinances limiting the amount of parking in a zone would also limit the area of impermeable surfaces. Researchers have noted

48. Lemann, *supra* note 12, at 449-50.

49. *Id.*

50. Meribeth Phipps, *What is Flood Plain Zoning?*, SF GATE (Nov. 20, 2018), <https://homeguides.sfgate.com/flood-plain-zoning-62280.html> [<https://perma.cc/7NA3-X7RJ>].

51. *Impervious Surfaces and Flooding*, USGS, https://www.usgs.gov/special-topic/water-science-school/science/impervious-surfaces-and-flooding?qt-science_center_objects=0#qt-science_center_objects [https://perma.cc/D5DM-MECH#qt-science_center_objects].

52. Kerrigan Owens, *Pervious Cover Minimums and Incentives*, SUSTAINABLE DEVELOPMENT CODE, <https://sustainablecitycode.org/brief/pervious-cover-minimums-and-incentives-7/> (last visited May 13, 2021) [<https://perma.cc/T33B-2TXE?type=image>].

that “in some areas where impervious surface areas are too high, green roofs might be a better alternative.”⁵³

A “green roof” is “a layer of vegetation planted over a waterproofing system that is installed on top of a flat or slightly-sloped roof.”⁵⁴ There are green roof designs being implemented in Massachusetts,⁵⁵ and there is potential for implementation in Portland.⁵⁶ There has been a number of green roof projects initiated in Maine.⁵⁷ Portland currently imposes a stormwater utility fee on properties based on the surface area of impervious surfaces.⁵⁸ Given the stormwater utility fee in Portland, green roofs may be particularly attractive options for property owners.

Green roofs can reduce the amount of impervious surface area on a property thus lowering the fee.⁵⁹ In addition the fee can be reduced for “property owners who take steps to reduce or eliminate runoff by building rain gardens, dry wells or retention ponds.”⁶⁰ These changes which help solve traditional flooding concerns will become increasingly crucial to address the imminent increase in storm water and flooding that will result

53. Portland State University, *Low-Income Neighborhoods More Vulnerable to Flooding, Extreme Heat*, SCIENCE DAILY (March 22, 2019), <https://www.sciencedaily.com/releases/2019/03/190322105731.htm> [https://perma.cc/7935-FAEH].

54. *What is a Green Roof?*, TECHNICAL PRESERVATION SERVICES, <https://www.nps.gov/tps/sustainability/new-technology/green-roofs/define.htm> (last visited May 13, 2021) [https://perma.cc/P9K5-MBZL].

55. *Featured Projects*, RECOVER GREEN ROOFS, <http://www.recovergreenroofs.com/residential> (last visited Apr. 4, 2020).

56. *See Green Roofs & Green Infrastructure: A Demonstration & Discussion*, WOODARD & CURRAN, <https://www.woodardcurran.com/event/green-roofs-and-green-infrastructure-a-demonstration-and-discussion-> (last visited May 20, 2021) [https://perma.cc/96FA-2F6Z?type=image].

57. A roofing company located in Massachusetts, Recover Green Roofs, LLC, explained that they have bid on a number of green roof projects in Maine.

58. *Stormwater Service Charge*, PORTLAND, ME, <http://portlandmaine.gov/1559/Stormwater-Service-Charge> (last visited Apr. 4, 2020) [https://perma.cc/CQ9A-33XH].

59. Rebecca Gullott, *Green Roofs Can Reduce Stormwater Runoff, Reduce Stormwater Fees!*, GREEN ROOF TECHNOLOGY (May 17, 2013), <http://www.greenrooftechnology.com/green-roof-blog/green-roofs-and-stormwater-fee> [https://perma.cc/7XKZ-4Z5X].

60. Randy Billings, *Portland Council Approved New Fees on Stormwater Runoff*, PORTLAND PRESS HERALD (Jan. 22 2015), <https://www.pressherald.com/2015/01/21/portland-council-approves-new-fees-on-stormwater-runoff/> [https://perma.cc/MJ5A-78XM].

from climate change. Another important zoning tool that could be used to prevent coastal flooding damage is the use of setbacks.⁶¹

A setback is a zoning restriction that “sets the minimum distance a building may be from a designated area, such as a sidewalk or street. Increasingly, building setbacks are also established to protect environmentally sensitive areas or critical wildlife habitat areas, including littoral and riparian areas, wetlands, forests, habitats for certain species, and shorelines.”⁶² Setbacks to protect critical habitat may be useful in Portland to push development further away from the coast over time or in safeguarding natural protections that already exist. As Davis notes in his article, the islands around Portland provide important protection from storm surges.⁶³ It is critical that “coastal cities at particular risk of flooding...protect any natural barrier islands that are present. These islands are the first line of defense against storm surge, whether from tropical cyclones or other storms at sea.”⁶⁴ Setbacks, and restrictions on impermeable surface and development on these islands will also be an important step in protecting Portland from coastal flooding.

Additional land use avenues for preparing for coastal flooding are through the implementation of transferrable development rights (TDRs) or tax incentives. These measures could be used to financially incentivize development away from high-risk areas, or at least maintain economic viability for businesses in areas that might need to be severely restricted. TDRs would allow property owners who are not able to further develop their property to sell their development rights.

As discussed, there are a variety of zoning strategies and tools that are available to employ in mitigating flood risk in developed coastal communities such as Portland. In fact, Maine and federal laws already provide some protective measures.

The aim of the following analysis is to evaluate Portland’s current preparedness for rising sea levels and flooding concerns as a result of climate change. This analysis will look at current federal laws and local zoning laws and how those zoning laws help address flood risks or compromise the safety of coastal communities such as Portland. This

61. Tyler Adams & Charles Bloom, *Setbacks Protecting Sensitive Habitats and Water Quality*, SUSTAINABLE DEVELOPMENT CODE, <https://sustainablecitycode.org/brief/setbacks-protecting-sensitive-habitats-and-water-quality-5/> [https://perma.cc/UU3T-5DXZ?type=image].

62. *Id.*

63. Davis, *supra* note 17, at 197.

64. Thead, *supra* note 7.

evaluation will also look at the economic impacts of land use controls to address flood risks and the potential economic impacts if we fail to prepare for rising sea level and flood risks. In reviewing current laws in place which help or hinder Portland's preparedness for sea level rise, it is apparent that certain Maine municipalities need to adopt more strict zoning laws. In the least, Portland needs to expand the high-risk zones to minimize the effects of impending flooding of coastal areas resulting from climate change. Laws which would incentivize development away from the coast or which incentivize developers to provide protection to vulnerable populations are also necessary.

The following analysis will first review current zoning related laws and how they affect Portland's preparedness; second, legal and economic restrictions to flood risk mitigation; third, economic consequences of potential flood disasters; and finally, possible land use control solutions.

I. LAND USE MEASURES CURRENTLY IN PLACE TO PREPARE PORTLAND MAINE FOR COASTAL FLOODING

There are land use measures currently in place at both the federal and state level which help prepare Portland for coastal flooding. In terms of federal influence, both the Coastal Zone Management Act ("CZMA") and the Federal Emergency Management Agency ("FEMA") play a role in Maine's preparedness. Locally, the Mandatory Shoreland Zoning Act ("MSZA") directs municipalities to create certain local zoning ordinances that protect Maine's shoreland. In addition, Governor Janet Mills signed into law an "Act to Help Municipalities Prepare for Sea Level Rise" in 2019.

A. *The Coastal Zone Management Act and the Maine Coastal Program*

CZMA is administered by the National Oceanic and Atmospheric Administration ("NOAA"). The goal of CZMA is to protect and restore the resources of the nation's coasts.⁶⁵ CZMA "encourages states to develop coastal management programs and makes them eligible for federal funds if they do so."⁶⁶ CZMA "assures [states] that federal agency activities, with certain exceptions, will be consistent with the enforceable

65. Courtney B. Johnson, *Advances in Marine Spatial Planning: Zoning Earth's Last Frontier*, 29 J. ENVTL. L. & LITIG. 191, 204 (2014).

66. Lemann, *supra* note 12, at 450.

provisions of state-developed and federally approved coastal management programs.”⁶⁷

Maine’s Coastal Program (MCP) was approved by NOAA in 1978.⁶⁸ Maine has published several Maine Coastal Plans pursuant to CZMA.⁶⁹ The goal of the MCP is to balance development and conservation of the state’s coastal resources.⁷⁰ Over the years, among other projects, the MCP has modeled the effects of sea level rise, developed management plans for Maine’s beaches, helped municipalities plan for growth, and used technology to identify and protect valuable habitats.⁷¹ The MCP has noted that addressing coastal hazards and mitigation is a high priority goal of the program.⁷² The MCP noted in 2006 that the population along the coast, particularly in southern Maine, has continued to grow rapidly.⁷³ Furthermore, “the density and value of coastal development have increased dramatically in southern Maine in the last five years. These trends are expected to continue and require a greater level of state management to avoid development in high hazard areas and to protect fragile coastal resources.”⁷⁴

The MCP has identified and analyzed several particular categories of concern related to coastal hazards including hurricanes/typhoons, storm surges, flooding, shoreline erosion, and sea level rise.⁷⁵ Accurate and up to date maps will be important in addressing all of these concerns. Unfortunately, with regard to storm surges, the MCP noted that “Flood Insurance Rate Maps (FIRM) are the best proxy for surge levels in a 100-year storm (most likely a northeaster) but existing paper map boundaries are not well georeferenced, many are outdated, and digital FIRMs in

67. Johnson, *supra* note 65, at 204.

68. *Maine Coastal Plan: Strategic Outlook 2016-2020*, *supra* note 29, at 13.

69. See *Publications*, STATE OF ME. DEPARTMENT OF MARINE RESOURCES, <https://www1.maine.gov/dmr/mcp/publications/index.html> (last visited Apr. 4, 2020) [<https://perma.cc/2S97-67R6>].

70. *Maine Coastal Plan: Final Assessment and Strategy under Section 309 of the Coastal Zone Management Act*, ME. STATE PLANNING OFFICE 1 (July 2006), https://www.maine.gov/dmr/mcp/downloads/coastalplans/mcp309plan_jul06.pdf [<https://perma.cc/N5ZY-JXV8>].

71. *Id.*

72. *Id.* at 2; *Maine Coastal Plan: Strategic Outlook 2016-2020*, MAINE COASTAL PROGRAM 1 (Oct. 2015), <https://www1.maine.gov/dmr/mcp/downloads/coastalplans/309-as-oct-29-15.pdf> [<https://perma.cc/WR7H-JZV2>].

73. *Maine Coastal Plan: Final Assessment and Strategy under Section 309 of the Coastal Zone Management Act*, *supra* note 70, at 2.

74. *Id.* at 33.

75. *Id.* at 27.

Maine lack the detail of paper maps.”⁷⁶ However, essential mapping projects have taken place over the last few years. Among these important mapping projects are coast-wide mapping of potential impacts of sea-level rise and mapping of coastal impervious surfaces.⁷⁷ As a result of Maine’s Coastal Plans, there will be updates to many important Maine programs, rules, and regulations that address coastal hazards, such as Maine’s Mandatory Shoreland Zoning program, the Maine Emergency Management Agency’s State Hazard Mitigation Plan, and FEMA flood insurance rate maps.⁷⁸

B. Federal Emergency Management Agency Mapping

FEMA, the Federal Emergency Management Agency, is a federal agency created in 1979 with the primary goal of preparing and protecting the nation from disasters.⁷⁹ Portland, Maine has elected to comply with the requirements of the National Flood Insurance Act of 1968.⁸⁰ The National Flood Insurance Program, established by this act, “provides that areas of the city having a special flood hazard be identified by [FEMA] and that flood plain management measures be applied in such flood hazard areas.”⁸¹

FEMA strives to regularly create and update flood hazard maps. FEMA uses the most advanced available technology to create these maps which assess the level of flood risks.⁸² The agency works with states and individual communities to determine necessary mitigation actions.⁸³ The process of preparing flood hazard maps is part of the National Flood Insurance Program which provides regulations and flood insurance requirements.⁸⁴ Thus, FEMA must “maintain accurate floodplain maps so

76. *Id.*; *Maine Coastal Plan: Strategic Outlook 2016-2020*, *supra* note 29.

77. *Maine Coastal Plan: Final Assessment and Strategy under Section 309 of the Coastal Zone Management Act*, *supra* note 70, at 4.

78. *Maine Coastal Plan: Strategic Outlook 2016-2020*, *supra* note 29, at 105.

79. *About the Agency*, FEMA, <https://www.fema.gov/about-agency> (last updated May 27, 2021) [<https://perma.cc/2HT2-H6GP>].

80. PORTLAND, ME., CITY OF PORTLAND LAND USE CODE art. 12.1 (as amended 3/15/21).

81. *Id.*

82. *About the Agency*, *supra* note 79. *Flood Maps*, FEMA, <https://www.fema.gov/flood-maps> (last updated March 4, 2021) [<https://perma.cc/A27S-9PMH>].

83. *Id.*

84. *Flood Insurance*, FEMA, <https://www.fema.gov/flood-insurance> (last updated May 26, 2021) [<https://perma.cc/FA9H-6ZQ7>].

it can determine the specific land use controls required, as well as the amount of insurance premiums.”⁸⁵ The currently available FEMA flood map viewer for Cumberland County contains preliminary 2017 map data and existing 1986 map data.⁸⁶ Maps currently effective are labeled “Flood Zones 1986 Effective” and the new proposed maps are labeled “Flood Zones 2017 Advisory – Not Yet Adopted.”⁸⁷ The maps with the 2017 data that are not yet adopted contain additional “Zone A” areas and “Zone V” areas.⁸⁸

Zone A is the special flood hazard area⁸⁹ and Zone V is the special flood hazard area subject to coastal high hazard flooding.⁹⁰ Pursuant to Portland land use ordinances, any development in areas of “special flood hazard” require permitting prior to obtaining any building permits.⁹¹ The review process for obtaining a permit in a special hazard area is thorough and extensive; however, limiting new development in the ways the permit process requires may still not be enough to protect against catastrophic flood damage. In addition, the FEMA zoning map may not reflect all of the current hazard areas.

Unsurprisingly, the islands surrounding Portland appear to be at particular risk according to the 2017 data.⁹² As noted in response to the potential FEMA re-mapping in 2010, “[t]he proposed [2010 FEMA] maps for Portland would designate the harbor a ‘V Zone,’ where winds and

85. Davis, *supra* note 17, at 188.

86. *FEMA Flood Maps*, PORTLAND, ME., <https://www.portlandmaine.gov/2087/FEMA-Flood-Maps> (last visited Apr. 4, 2020) [<https://perma.cc/THU8-KQ2S>].

87. *Flood Map Viewer How To*, PORTLAND, ME., <https://www.portlandmaine.gov/DocumentCenter/View/22037/Flood-Map-Viewer-How-To> (last visited Apr. 4, 2020) [<https://perma.cc/ZX2T-97VD>].

88. *Flood Map Viewer*, PORTLAND, ME., <https://portlandme.maps.arcgis.com/apps/webappviewer/index.html?id=975da31f7aff455d8da5ae0776efac55> (last visited Apr. 4, 2020) [<https://perma.cc/CK7Z-UAW6>].

89. *FEMA Flood Maps and Zones Explained*, FEMA, <https://www.fema.gov/blog/fema-flood-maps-and-zones-explained> (last visited May 13, 2021) [<https://perma.cc/6JYB-B25Z>]. See also *National Flood Insurance Program Terminology Index*, FEMA, <https://www.fema.gov/flood-insurance/terminology-index> (last visited May 13, 2021) [<https://perma.cc/S5JW-N8VG>].

90. *High Hazard Area*, FEMA, <https://www.fema.gov/glossary/high-hazard-area> (last visited May 13, 2021) [<https://perma.cc/4QBT-UFXW>]; *FEMA Flood Maps and Zones Explained*, *supra* note 89.

91. PORTLAND, ME., CITY OF PORTLAND LAND USE CODE art. 12.4.1 (as amended 3/15/21) (the permitting process requires extensive research of environmental considerations, certain building standards and materials, minimum elevations, minimum drainage

92. *Flood Map Viewer*, *supra* note 88.

waves can act in tandem to tear a building down. The piers currently fall within the relatively lenient ‘A Zone,’ which requires new buildings to be slightly raised.”⁹³ Although much of the new area that would be designated as Zone V under the 2017 data map is located on the ocean or very near to the coast where there is already minimal development, whether the FEMA zone maps provide an accurate representation of the true V Zone areas is yet to be seen.

On the 2017 data map, downtown waterfront Portland is primarily designated Zone X, a moderate or minimal hazard area. However, in January of 2018, News Center Maine reported that “[t]he astronomical high tide [that occurred] during Thursday’s blizzard caused flooding along Portland’s waterfront and damaged homes and businesses.”⁹⁴ In addition, this report noted that “[f]looding is common in the area during storms, but people who live there said this is the highest they’ve ever seen it.”⁹⁵ Perhaps a dismal foreshadowing, the article ends by noting “[d]espite adding extra firefighters and plow drivers, there was nothing crews could do to stop the seas from rising.”⁹⁶ More recently, in March of 2019, WMTW similarly reported downtown flooding due to unusually high tides.⁹⁷ There are many other similar news stories about downtown Portland.⁹⁸ Even though some areas of downtown Portland are known for

93. Evan Lehmann, *Port City Pushes Back Against Washington’s Tightening Flood Insurance Definitions*, N.Y. TIMES (Sep. 29, 2009), <https://archive.nytimes.com/www.nytimes.com/cwire/2009/09/29/29climatewire-port-city-pushes-back-against-washingtons-ti-24450.html> [<https://perma.cc/SKV5-VFW6>].

94. Chris Costa, *Flooding on Portland Waterfront Damages Homes, Businesses*, NEWS CENTER ME. (Jan. 4, 2018), <https://www.newscentermaine.com/article/news/local/flooding-on-portland-waterfront-damages-homes-businesses/97-504939075> [<https://perma.cc/53HX-FK3G>].

95. *Id.*

96. *Id.*

97. *Heavy Rain, High Tide Cause Flooding, Close Roads*, WMTW NEWS 8 (March 22, 2019), <https://www.wmtw.com/article/friday-high-tide-flooding/26880481> [<https://perma.cc/P8PV-GGF2>].

98. See Lou Lockwood, *Portland Issues Flood Warning On Commercial Street This Weekend*, WJBQ (Dec. 21, 2018), <https://wjbq.com/portland-issues-flood-warning-on-commercial-street-this-weekend/> [<https://perma.cc/S7FW-T7L9>]; *Street Flooding Possible Tonight in Portland*, WGME (Aug. 12, 2018), <https://wgme.com/news/local/street-flooding-possible-tonight-in-portland> [<https://perma.cc/25ZH-ZUQW>]; *Crews Clean up Flood Damage After Heavy Rain*, WGME (Jan. 25, 2019), <https://wgme.com/news/local/crews-clean-up-flood-damage-after-heavy-rain> [<https://perma.cc/MLB6-NZUH>]; Dennis Hoey, *Streets and Basements Flood as Heavy Rain Sweeps Through Maine*, CENTRAL MAINE (Jan. 24, 2019), <https://www.centralmaine.com/2019/01/24/streets-and-basements-flood-as-heavy-rain-sweeps-through-maine/> [<https://perma.cc/B8FS-7M3X>].

repeated and serious flooding, development continues. This would suggest current FEMA regulations related to the Portland flood maps are not sufficient to address the conflict between serious flooding and continued development on Portland's waterfront.

Davis, in arguing against more restrictive FEMA zoning in Portland in 2010, claimed that a new determination of V Zone designations would too severely impact development in Portland, noting that in the stricter V Zone, "there is a complete ban on new construction. In addition, current buildings cannot be fully rebuilt if they need repair. They can only be rebuilt to half their value. The new designation would likely halt all development and leave lobstermen and other fishermen as the only remaining tenants."⁹⁹ Despite these serious economic concerns, drastic restrictions on development are justified in the face of increasing risks due to sea level rise. The answer may not be to zone all of coastal Portland as a V Zone and halt all development, but to analyze which areas are truly at the most risk and begin to gradually move development out of those areas. Additionally, if FEMA rezoning is determined to be too drastic for Portland, there are other avenues Portland may take in adopting development restrictions without some of the additional burdens that may come from drastic changes to the FEMA flood maps.

C. The Mandatory Shoreland Zoning Act

Perhaps the most important current law with regards to zoning and flood risks in Maine is the Mandatory Shoreland Zoning Act.¹⁰⁰ "The Mandatory Shoreland Zoning Act ("MSZA") "requires municipalities to adopt, administer, and enforce local ordinances that regulate land use activities in the shoreland zone."¹⁰¹ Under the MSZA, Maine's municipalities must "adopt ordinances regulating land use activities within: 250 feet, horizontal distance, of the normal high-water line of great ponds, rivers, and tidal waters."¹⁰² Pursuant to 38 M.R.S. § 439-A(4)(b), any structures within twenty-five feet of the normal high-water mark of a waterbody may not be expanded, even if expansion would not increase

99. Davis, *supra* note 17, at 191.

100. 38 M.R.S. §§ 435-449 (2019).

101. *Mandatory Shoreland Zoning*, ME. DEPARTMENT OF ENVIRONMENTAL PROTECTION, <https://www.maine.gov/dep/land/slz/index.html> (last visited Apr. 5, 2020) [<https://perma.cc/4K9M-PXHD>].

102. *Dep Information Sheet*, ME. DEPARTMENT OF ENVIRONMENTAL PROTECTION (March 2018), <https://www.maine.gov/dep/land/slz/ip-setback.pdf> [<https://perma.cc/97VT-X8XX>].

nonconformity with the setback requirements.¹⁰³ Thus, the statute also imposes various maximum area restrictions for new or altered structures within certain distances from the normal high-water line (imposing restrictions up to 250 feet from the high-water mark).¹⁰⁴ The statute thus sets some minimum requirements for all municipalities in the state.

In regard to shorelands, Portland, Maine's Land Use Code generally requires "[a]ll principal and accessory structures shall be set back at least 75 feet horizontal distance from the normal high water line of water bodies, the upland edge of a wetland or associated tributary streams within a Shoreland Zone."¹⁰⁵ However, there are certain exceptions to this requirement. In Zones B-3, B-5/B-5b, I-L on-peninsula, and I-M on-peninsula, the setback requirement is 25 feet.¹⁰⁶ In Zones WCZ, WPDZ, I-B, EWPZ, no setbacks are required (except that pier edge setbacks apply in EWPZ, WCZ and WPDZ).¹⁰⁷ In addition, "accessory detached structures of less than 100 square feet of floor area shall be permitted with no setback, provided that such structures shall be used only for the storage of fish, bait, and related equipment."¹⁰⁸ Lastly, structures that require direct access to water as an operational necessity have no setback requirements (such as piers, docks, and retaining walls).¹⁰⁹

With regard to elevation levels in the shoreland, the lowest elevation of a building floor "shall be elevated at least one foot above the elevation of the 100-year flood, the flood of record, or in the absence of these, the flood as defined by soil types identified as recent flood plain soils."¹¹⁰ This may be problematic because the code is based on flooding that has occurred in the past. Flooding is now projected to increase to historically unprecedented amounts due to sea level rise, an increase in impermeable surfaces, and changes in climate patterns.

The Portland land use code for shoreland areas also requires that roads, driveways and parking areas be setback a minimum of 75 feet from the normal high-water mark except in certain areas or when no other reasonable alternative exists.¹¹¹ However, existing public roads may be

103. 38 M.R.S. §439-A(4)(b) (2021).

104. *Id.* at §439-A(4)(A-B).

105. PORTLAND, ME., CITY OF PORTLAND LAND USE CODE, art. 11.4.1(A) (as amended 3/15/21).

106. *Id.* at art. 11.4.1(A)(1).

107. *Id.* at art. 11.4.1(A)(2).

108. *Id.* at art. 11.4.1(D).

109. *Id.*

110. *Id.* at art. 11.4.1(E).

111. *Id.* at art. 11.4.10-11.

expanded regardless of setback requirements.¹¹² Although the existing land restrictions do help with flood preparation and mitigation, they are not directly designed to address flooding that will continue to worsen due to global climate change and sea level rise.

D. An Act to Help Municipalities Prepare for Sea Level Rise

In May of 2019, Governor Janet Mills of Maine signed into law, “An Act to Help Municipalities Prepare for Sea Level Rise.” Maine statute now explicitly asserts that it is a goal of the state “[t]o plan for the effects of the rise in sea level on buildings, transportation infrastructure, sewage treatment facilities and other relevant state, regional, municipal or privately held infrastructure, property or resources.”¹¹³ The new provisions authorize municipalities to adopt rules necessary to carry out this goal.¹¹⁴ The act “enables these jurisdictions to integrate strategies for addressing sea-level rise into growth management elements of local or regional comprehensive plans and to develop coordinated plans across jurisdictions.”¹¹⁵ Although the act will not immediately provide restrictions or incentives for coastal flood risk areas, the act will allow and encourage individual municipalities to identify the particular risks unique to the municipality and to implement the best ways to address those risks.

The act is significant because it affects the goals of municipalities and directs them to consider sea level rise concerns. In addition, it will also begin to affect the psychology of the people of Maine. This act is a direct acknowledgement on a statewide level that sea level rise is a real and immediate problem. Much of the testimony during the legislative process for this new law acknowledged the importance and significance of this act.¹¹⁶ While the act will allow Portland to orient its goals to address sea level rise, its importance is compounded by the fact that Portland has long struggled to address sewage and drainage problems.

112. *Id.* at art. 11.4.10(B).

113. *Id.* at § 4312(3)(n).

114. 30-A M.R.S. § 4312(4).

115. *Maine Act to Help Municipalities Prepare for Sea Level Rise (LD 563)*, ADAPTATION CLEARINGHOUSE (May 29, 2019), <https://www.adaptationclearinghouse.org/resources/maine-act-to-help-municipalities-prepare-for-sea-level-rise-ld-563.html> [https://perma.cc/45S4-BC5K].

116. Thomas Abello, *Testimony before the Joint Standing Committee on State and Local Government*, THE NATURE CONSERVANCY 1 (March 6, 2017), <https://legislature.maine.gov/legis/bills/getTestimonyDoc.asp?id=42290> [https://perma.cc/U6ZU-M6GC].

E. Environmental Laws and Portland's Sewage Overflow System

Portland, Maine faces particular concerns in dealing with stormwater runoff and overflow. Portland has a combined sewer overflow system.¹¹⁷ A combined sewer overflow system is a system by which “a community’s sanitary waste and stormwater runoff flow into the same underground pipes.”¹¹⁸ This is problematic because the capacity of the sewers and treatment plants can be overwhelmed during heavy storms, resulting in the discharge of raw untreated sewage combined with stormwater directly into Casco Bay.¹¹⁹ These discharges are referred to as combined sewer overflows (CSOs).¹²⁰ CSOs “result in the introduction of millions of gallons of polluted water to rivers and the Bay annually. Pathogens from CSOs can lead to human health threats and closures of beaches and shellfish beds.”¹²¹

In 2018, the Portland Press Herald reported that “[n]early 69 million gallons of stormwater mixed with raw sewage, debris and polluted runoff flowed into Back Cove, Portland Harbor and local waterways on Oct. 21 and 22 as the storm exceeded the capacity of Portland’s treatment plants.”¹²² This problem will continue to get worse as more flooding occurs in Portland. There is concern that, as a result of Portland’s aging water transport facilities and wastewater treatment systems, there will be increasingly “more sewage overflows, broken pipes, and costly repairs.”¹²³

117. See *Historical Reports and Assessments*, PORTLAND ME., <http://www.portlandmaine.gov/1835/Reports-and-Assessments> (last visited Apr. 5, 2020) [<https://perma.cc/2NLV-BLWU>].

118. *Casco Bay Estuary Partnership Priority Area Factsheet #1: Minimizing stormwater pollution*, CASCO BAY ESTUARY PARTNERSHIP (2011), https://www.harpswell.maine.gov/vertical/sites/%7B3F690C92-5208-4D62-BAFB-2559293F6CAE%7D/uploads/stormwater_factsheet.pdf [<https://perma.cc/NX8P-6M8P>].

119. *Id.*

120. *Id.*

121. *Id.*

122. Kevin Miller, *Millions of Gallons of Portland Sewage Still Overflowing into Casco Bay*, PORTLAND PRESS HERALD (Jan. 7, 2018), <https://www.pressherald.com/2018/01/07/a-legacy-problem-combined-sewer-stormwater-overflows-challenges-portland/> [<https://perma.cc/9SK7-2MV5>].

123. *How is Climate Change Impacting Casco Bay?*, FRIENDS OF CASCO BAY, <https://www.cascobay.org/casco-bay/how-is-climate-change-impacting-casco-bay/> (last visited May 13, 2021) [<https://perma.cc/CM4P-YU86>].

Although “[t]hese discharges of diluted untreated wastewater violate both State and Federal water pollution laws,”¹²⁴ the problem will nevertheless take decades to fix.¹²⁵ Currently, “[m]unicipalities or Sewer Districts that have CSOs are required to license them with the Maine Department of Environmental Protection. License requirements direct these communities to evaluate their CSO problems and determine cost effective solutions to abate them.”¹²⁶ Thus, the issue is certainly not being ignored. There have been many efforts to change this system, including the above-mentioned stormwater utility fee.¹²⁷ The stormwater utility fee is imposed on all properties in Portland with rooftops and paved areas.¹²⁸ Further, “[t]he city of Portland, Maine has undergone massive improvements in efforts to improve combined sewage and storm water overflow into the Casco Bay. The city has been steadily improving stormwater management since 1989 when the Conservation Law Foundation filed suit against the city for storm-related sewage overflows.”¹²⁹ Portland is roughly halfway through a 40-year, \$250 million project to reduce the amount of raw sewage that is being released into local waters.¹³⁰ During 1989, “the city recorded discharging 1.8 billion gal of storm water and sewage discharge, however, in 2016 the city reported 318.4 million gal—an 80% decrease.”¹³¹ In addition, very recently Portland began construction of a large project to help prevent the release of raw sewage into Back Cove and Portland Harbor.¹³² Portland is constructing a 3.5 million gallon underground tank to store additional

124. *Combined Sewer Overflow Program*, ME. DEPARTMENT OF ENVIRONMENTAL PROTECTION, <https://www.maine.gov/dep/water/cso/> (last visited Jan. 4, 2021) [<https://perma.cc/Q49Z-FGE2>].

125. Miller, *supra* note 122.

126. *Combined Sewer Overflow Program*, *supra* note 124.

127. *See supra* Introduction Part C.

128. *Stormwater Service Charge*, *supra* note 58.

129. *Portland, Maine, Struggles with Combined Storm Water, Sewer Infrastructure*, STORM WATER SOLUTIONS (Jan. 8, 2018), <https://www.estormwater.com/sewers-drainage-systems/portland-maine-struggles-combined-storm-water-sewer-infrastructure> [<https://perma.cc/4ACC-XMF3>].

130. Miller, *supra* note 122.

131. *Portland, Maine, Struggles with Combined Storm Water, Sewer Infrastructure*, *supra* note 129.

132. Shannon Moss, *Huge Construction Project will Help Prevent Combined Sewage Overflow (CSO) from Going into Back Cove and Portland Harbor*, NEWS CENTER MAINE (Sep. 2, 2020), <https://www.newscentermaine.com/article/tech/science/environment/what-is-going-on-at-back-cove-construction-that-will-result-in-less-flooding/97-0f3688f7-40bd-4856-ba01-843074e9f92b> [<https://perma.cc/S5R4-DHWG>].

storm related sewage overflow, which will be located under the soccer fields on Back Cove by the Preble Street Extension.¹³³ The design is projected to eliminate “40% of all of the combined sewage overflows that is discharged in the city of Portland and goes into one of [the city’s] waterways.”¹³⁴ It is apparent that strategies that have been implemented thus far are proving effective, and Portland has been decreasing the amount of raw sewage being released. Although the situation is improving, and efforts have not been wasted, sea level rise will likely worsen the problem and expose developed areas to increased health concerns, especially in the event of catastrophic flooding. Forebodingly, disastrous flooding has occurred in other parts of the country, which demonstrate the potential devastation and the wide range of effects such floods can have.

The disaster of Hurricane Katrina in 2005 in New Orleans, Louisiana is one of the most striking recent catastrophes illustrating the destruction that storms and flooding can produce. A 2019 article notes that “[p]erhaps the longest-lasting impact of Hurricane Katrina was the environmental damage that impacted public health. Significant amounts of industrial waste and raw sewage spilled directly into New Orleans neighborhoods, and oil spills from offshore rigs, coastal refineries, and even corner gas stations also made their way into residential areas and business districts throughout the region.”¹³⁵ Accordingly, conforming to environmental laws to prevent such contaminations is essential. Unfortunately, “[a]ccording to Hugh Kaufman, an EPA senior policy analyst, environmental regulations in place to prevent the types of discharges that occurred during Hurricane Katrina were not enforced, making what would have been a bad situation much worse.”¹³⁶ Without meaningful enforcement, many regulations meant to mitigate flooding concerns or environmental protection are rendered ineffectual.

Initially, “Katrina didn’t serve as a warning to areas beyond the Gulf Coast. New Orleans was considered unique because the city was built below sea level Opinions changed after Hurricane Sandy in 2012, however ‘Sandy was a wake-up call that this could happen

133. *Id.*

134. *Id.*

135. Larry West, *The Environmental Impacts of Hurricane Katrina*, THOUGHTCO. (May 8, 2019), <https://www.thoughtco.com/environmental-impacts-of-hurricane-katrina-4686766> [<https://perma.cc/6542-VA3V>].

136. *Id.*

anywhere.”¹³⁷ Although Portland does not have the particular geographical vulnerabilities that New Orleans does, which contributed to the widespread devastation of Katrina, the event serves as a chilling warning of the very real threat of climate change disasters.¹³⁸ In addition, the events surrounding Hurricane Katrina shed light on the social justice and ethical implications of these catastrophic events, particularly in regard to environmentally hazardous discharges and sewage maintenance systems. While there may be both federal and state laws in place to address water pollution problems resulting from flooding and stormwater, the key is to strive towards continued compliance with those laws and to keep in mind the increasing potential for disasters. In addition, as sea level rises and flooding worsens at an unprecedented rate, it is imperative that Portland pursue more extreme measures to distribute risks. There are, however, legal and economic challenges to expanding restrictions in Portland.

II. LEGAL AND ECONOMIC RESTRICTIONS TO FLOOD PREPAREDNESS

While there is certainly a growing need to address the flooding concerns due to sea level rise and intensifying storms, there are barriers to increasing land use restrictions. The main challenges concern the conflict between community needs and individual property rights, as well as the conflict between immediate economic dependency on coastal development and the need to address long term risk. Although the goal of land use law is to protect the health and welfare of communities, the needs of a community may conflict with the personal property rights of individuals.

137. Laura Diamond, *10 Years after Katrina: Lessons Learned, Lessons to Learn*, GA. TECH NEWS CENTER (2015), <https://rh.gatech.edu/features/10-years-after-katrina-lessons-learned-lessons-learn> [<https://perma.cc/2T42-G6HZ>].

138. See Doyle Rice, *Study: Climate Change Adding Billions to U.S. Hurricane Costs*, USA TODAY (Oct. 19, 2015), <https://www.usatoday.com/story/weather/2015/10/19/climate-change-hurricane-costs/74222944/> (indicating some scientists argue climate change has increased hurricane damage such as that of Katrina; others disagree) [<https://perma.cc/XT5A-5UPV>]. See also Doyle Rice, *New York City Flood Risk Rising Due to Climate Change*, USA TODAY (Sep. 28, 2015), <https://www.usatoday.com/story/weather/2015/09/28/new-york-city-flooding-floods-flood-hurricane-sandy-climate-change/72987564/> (stating risk of major flooding is likely to occur more frequently due to human-caused global warming) [<https://perma.cc/LN85-KCL8>]. An atmospheric scientist suggested that blizzards and nor'easters may cause increasing flood heights due to sea level rise. *Id.*

A. Limitations on Land Use Restrictions that Impede Personal Property Rights

Under the Fifth Amendment of the U.S. Constitution, the federal government cannot deprive any person “of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.”¹³⁹ This is often referred to as the federal “Takings Clause.” Similarly, the Fourteenth Amendment provides that no state shall “deprive any person of life, liberty, or property, without due process of law.”¹⁴⁰ In other words, the Takings Clause prohibits the government from taking private property without paying for the property. Whether a “taking” has occurred is not always clear. In determining whether a “taking” has occurred, “the manner of state action may matter: Condemnation by eminent domain, for example, is always a taking, while a legislative, executive, or judicial restriction of property use may or may not be, depending on its nature and extent.”¹⁴¹ Thus, a taking can be either regulatory, where laws are so restrictive as to deprive the owner of their property rights, or by eminent domain, in which a property is repossessed by the government for public benefit. In the zoning law context, this means that it is unconstitutional for land use laws to be so restrictive as to essentially deprive individuals of their right to use their property as they wish, without providing the property owner with just compensation for taking away that right. Just compensation must be “paid contemporaneously with the taking[]—that is, the compensation must generally consist of the total value of the property when taken, plus interest from that time.”¹⁴² Generally, there is not a bright-line rule for determining whether a regulatory taking has occurred. Throughout the history and development of regulatory takings law, the Supreme Court has “eschewed any ‘set formula’ for determining how far is too far, preferring to ‘engage in . . . essentially ad hoc, factual inquiries.’”¹⁴³ However, there are two categories that do not require fact-specific inquiries and those are (1) when there has been a physical invasion of the property, or (2) when a regulation denies all economic and productive use of the land.¹⁴⁴

139. U.S. CONST. amend. V.

140. U.S. CONST. amend. XIV, § 1.

141. *Stop the Beach Renourishment, Inc. v. Fla. Dep't of Env'tl. Prot.*, 560 U.S. 702, 702 (2010).

142. *Knick v. Twp. of Scott*, 588 US ___, 139 S. Ct. 2162, 2170 (2019).

143. *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1015 (1992) (quoting *Penn Central Transp. Co. v. New York City*, 438 U.S. 104, 124, 98 (1978)).

144. *Id.*

In the U.S. Supreme Court case *Lucas v. South Carolina Coastal Council*, the Court analyzed whether building restrictions on a property resulted in a taking.¹⁴⁵ The Court held that “when the owner of real property has been called upon to sacrifice all economically beneficial uses in the name of the common good, that is, to leave his property economically idle, he has suffered a taking.”¹⁴⁶ In *Lucas*, a landowner (Lucas) had purchased two residential lots on a South Carolina barrier island on which he intended to build homes.¹⁴⁷ When Lucas purchased the properties, they were not subject to the South Carolina coastal zone building permit requirements.¹⁴⁸ However, two years after Lucas purchased the lots, the legislature enacted the Beachfront Management Act to protect critical coastal areas, which prohibited Lucas from building any permanent habitable structures on his properties.¹⁴⁹ Lucas filed a lawsuit claiming that the ban on construction was a taking under the Fifth Amendment and required due process under the Fourteenth Amendment.¹⁵⁰

The Court reiterated the rule that the Fifth Amendment is violated when the regulation “does not substantially advance legitimate state interests” or when the violation “denies an owner economically viable use of his land.”¹⁵¹ In other words, even if a regulation is enacted for the public welfare, compensation will still be due to the owner if the regulation denies the property owner all economically viable use of the land. In *Lucas*, and in cases where zoning laws are enacted to address flood risk, it is clear that the regulation advances the public welfare, so the more difficult question is whether such regulation deprives the owner of the value of their property. The issue in declaring zoning laws such as these as takings is that it would require the State to pay just compensation to the landowner, and “[g]overnment hardly could go on if to some extent values incident to property could not be diminished without paying for every such change in the general law.”¹⁵² Thus, the determination of a taking must strike a balance between allowing the government to protect public interests and protecting individual rights from government intrusion under the guise of

145. *Lucas v. S.C. Coastal Council*, 505 U.S. 1003, 1006 (1992).

146. *Id.* at 1019.

147. *Id.* at 1007.

148. *Id.*

149. *Id.*

150. *Id.* at 1009.

151. *Id.* at 1016 (quoting *Agins v. City of Tiburon*, 447 U.S. 255, 260 (1980)).

152. *Id.* at 1018 (quoting *Pa. Coal Co. v. Mahon*, 260 U.S. at 415).

advancing the public welfare.¹⁵³ In the context of additional zoning regulations to prevent flood risk, the necessity to pay property owners compensation will largely depend on the extent of value that is diminished by the regulations, as well as the rights that the property owner already held.

Interestingly, the law at issue in *Lucas* was enacted “in response to the problem of coastal erosion due to sea level rise, and it expressly sought to accomplish ‘a gradual retreat from the [beach sand dune] system over a forty-year period.’”¹⁵⁴ The law prohibited new permanent construction in certain areas and other areas were subjected to regulations determining size and setbacks for new construction.¹⁵⁵ Overall, “*Lucas* is broadly understood to mean that states cannot ‘baldly prohibit all new development in upland areas judged likely to be submerged by future sea-level rise without likely involving the payment of compensation.’”¹⁵⁶

Lucas demonstrates the difficulty arising from restrictive land use laws in the context of individual rights and can be considered in relation to Portland and other coastal communities seeking to address sea level rise. In implementing measures to move development away from the coast to decrease the number of impermeable surfaces and to protect natural habitats that serve as a protective barrier to development, it will be necessary for the city of Portland to examine how these measures may affect and decrease property values. The Constitution does not allow zoning laws that nullify the value of coastal property without paying just compensation, even if the law serves a necessary goal of protecting the community. Thus, the process of moving people and development away from coastal hazard areas will prove to be a gradual process. The steps in implementing such goals will necessarily be deeply intertwined in the economic system of the city.

Despite the challenges arising from the takings clause, some have argued that, “under certain circumstances, climate change adaptations could present the type of emergency situation that American courts have frequently held exempts the government from takings liability.”¹⁵⁷ Courts have recognized “a public necessity exception to takings claims in contexts that could be similar to the position governments will soon find

153. *Id.*

154. Lemann, *supra* note 12, at 452-53.

155. *Id.*

156. *Id.* at 453.

157. Jeremy Patashnik, *Note: The Trolley Problem of Climate Change: Should Government Face Takings Liability if Adaptive Strategies Cause Property Damage?*, 119 COLUM. L. REV. 1273, 1273 (2019).

themselves in with climate change-adaptation decisions.”¹⁵⁸ The exception has applied when governments have acted in emergencies “to gain a strategic advantage during times of war or to stop the spread of fire,” circumstances in which the government was not held liable for a taking.¹⁵⁹ These public necessity cases have arisen in contexts unrelated to climate change, but the “justifications for why the government [did] not face takings liability in these cases would likely be applicable in climate change takings cases.”¹⁶⁰ Thus, it is unknown at this time whether courts will be willing to extend a public necessity exception to flood related situations. Even so, an exception such as this may not be useful in measures to prevent flooding, as war and fire present problems with such immediacy that the justification for the exception may not be comparable to the need to prevent flooding. The process of increased flooding may be, at first, relatively slow and out of the public view. The inconspicuous and seemingly imperceptible encroaching nature of this threat is particularly problematic in that it may not necessitate a sense of urgency within public perception. In other words, there exists an overarching and dangerous public misconception that problems related to climate change and rising sea levels pertain only to some abstract and distant future, and thus allocating resources to flood preparedness should not take priority over more palpable economic development.

B. Economic, Psychological and Ethical Challenges to Implementing Land Use Measures in Portland

Unfortunately, in the context of climate change and rising sea levels, Portland’s economy is largely based upon coastal development and coastal activities. In his 2010 article, Davis asserts that because of Portland’s dependency on coastal development, “the National Flood Insurance Program (NFIP), a scheme created for financial reasons, is unnecessarily working against its own purpose by halting development and threatening to wreak economic havoc.”¹⁶¹ *The Portland Press Herald* focused a 2013 article on the potential negative effects of FEMA rezoning, warning that property owners may face increasing insurance costs as a result.¹⁶² The

158. *Id.* at 1276.

159. *Id.* at 1277.

160. *Id.*

161. Davis, *supra* note 17, at 182.

162. Jessica Hall & J. Craig Anderson, *New Flood Zones to Hit Some Maine Landowners Hard*, PORTLAND PRESS HERALD (Nov. 6, 2013),

article noted that “Maine’s rate of floodplain appeals is three times the national average, according to the Maine Floodplain Management Program.”¹⁶³ Under this program, there are serious economic impacts that incentivize the population to resist being classified in higher risk zones. An increase in insurance rates in higher risk zones could help facilitate retreat, but we have seen in 2010 and 2013 the extreme public resistance resulting from these measures.

Increased insurance rates in the most high-risk areas is further troubling given the concentration of lower income communities in those high-risk areas of Portland, because even if tenants are not directly paying for the insurance, increased rates drive up the cost of housing. Lack of affordable housing is a pressing issue in Portland, and higher insurance rates or more restrictive building regulations are likely to exacerbate the problem. Of the types of land uses that are exercised in a community, concentrated residential use in high risk areas allocates risk on those least likely to be able to withstand the consequences of a flood disaster. Therefore, housing, in particular, should be disincentivized in high flood risk areas by implementing zoning laws that prohibit new residential uses those areas. In the context of the current housing crisis, Portland will need to find alternative development sites for new affordable housing projects.

Given Portland’s coastal based economy, as well as its long history and cultural identification as a seaside tourist town, the idea of retreat from the coast is likely to be very unpopular. Such collective disapproval, coupled with takings doctrine restrictions, will likely make any effort to move the population away from the coast expensive and difficult for the state of Maine. Some commentators argue that, as a result of the unpopularity of retreat, the only viable option is voluntary buyouts.¹⁶⁴ “Voluntary public acquisition of flood-prone properties has the dual benefits of being politically palatable and achieving permanent removal of structures from floodplains.”¹⁶⁵ However, buyouts are very expensive as well, and therefore do not represent a complete solution.

In combatting the strong public resistance to retreat, public education will serve as an important step in the process of preparing for sea level rise. Property owners and residents of coastal communities must be made aware that flood risks resulting from sea level rise is, in fact, a serious and immediate problem. It is in the property owner’s best interest to invest in

https://www.pressherald.com/2013/11/06/new_flood_zones_to_hit_some_property_owners_hard_in_york_cumberland_counties/ [https://perma.cc/J7KG-7MTM].

163. *Id.*

164. Lemann, *supra* note 12, at 454-55.

165. *Id.*

measures to mitigate risk, even for developers who plan to own the land for a short period of time. Maine buildings pose certain risks that buildings in other areas of the country do not have. Year 2000 census data suggests that almost 50% of housing units in Portland were built before 1939.¹⁶⁶ In addition, Maine housing units often have basements, unlike those in southern areas, for example, and the majority of Maine buildings are heated through oil and heating systems that are typically located in the basement. The effects of flooding on these construction practices should at least be considered by developers or businesses working in higher risk areas.

Another potential impediment to flood preparation is that implementation of flood control measures to protect areas of Portland could divert more water to, and cause more severe flooding in, other areas. This raises serious ethical dilemmas. “If rising sea levels or extreme weather events threaten life and property, governments may be forced to act to minimize the human and economic costs of climate change. Some of these adaptive strategies might benefit certain property owners and communities at the expense of others.”¹⁶⁷ If Portland chooses to erect barriers to protect economically important areas of Portland such as Commercial Street, other low-lying areas such as East Bayside may be severely harmed. This raises more concerns about the effects low income or minority communities. Therefore, any plans to address sea level rise will need to consider how those changes impact other areas.

III. RECOMMENDATIONS FOR PORTLAND

Although there would likely be economic consequences to increased land use regulations in Portland, the negative economic consequences of a flood disaster would be far more severe. In addition to costly repairs and reconstruction, a severe flood disaster could shut down businesses, halt economic stimulation from tourism, prevent export of commodities, and result in the loss of many jobs. Thus, despite the apparent economic concerns that would arise from increased regulation, the losses that would incur as a result of being ill-prepared for major storms and flooding would be far more grievous. In reviewing the laws currently in place in Portland and the risks the city is facing, it is apparent that the city must establish increased public education programs and zoning regulations. In addition,

166. *Portland, Maine, Housing Statistics*, INFOPLEASE, <https://www.infoplease.com/us/maine/housing-statistics-1> (last visited Apr. 5, 2020) [<https://perma.cc/N4ER-WEXL>].

167. Patashnik, *supra* note 157, at 1274.

addressing issues of social justice and economic inequality arising from flood concerns should be a priority. Psychology plays an important role in addressing sea level rise concerns. As has been discussed, much of Portland's identity and economic draw comes from its status as a coastal city. In addition, Mainers have not previously addressed issues such as rising sea levels due to climate change. Therefore, public education about the impacts that Portland residents are likely to see as a result of sea level rise will be an essential step in addressing the issue. There is much debate about whether managed retreat is truly a possible option, especially given human nature to rationalize inaction because the risk seems too uncertain or distant. The starting point will be to provide people with the knowledge to make informed decisions about their properties and homes. Although public education itself is not a zoning tool, psychology and knowledge of the population will shape the efficacy of zoning regulations.

Furthermore, the collective community of Portland will have to decide what aspects of the city should be prioritized. This will require an analysis of Portland's cultural values. In taking steps to address flooding concerns, the cultural significance of various areas must be considered.¹⁶⁸ In doing so:

the specific values of a community might limit the strategies that are employed there. For instance, some communities might prioritize their beaches over everything else and therefore they will plan around this priority. Others might have historic waterfronts or buildings which they might prioritize over other features. Identifying these existing cultural attachments and values can help guide a local community's adaptation efforts.¹⁶⁹

For Portland, protecting historic waterfront areas for cultural and tourism purposes is likely to be a priority. Portland will also need to determine if the ultimate goal is to retreat, to manage the risks in other ways, or some combination of both. Coastal adaptation strategies are often centered around three potential goals: "protect," "accommodate," and "retreat."¹⁷⁰ In terms of potential tools, "[c]oastal adaptation strategies can include enacting state legislation and local ordinances, land use plan changes, permit conditions, built infrastructure, habitat restoration, or financial tools and incentives."¹⁷¹ Planning, selecting and implementing such tools can be strategically centered around Portland's particular priorities.

168. Reiblich, Wedding & Hartge, *supra* note 43, at 172.

169. *Id.*

170. *Id.* at 173.

171. *Id.*

A. Protecting Critical Habitat

Protection of critical habitats will be another important element of mitigating flood risk in Portland. As discussed, the islands surrounding Portland have historically served an essential role in protecting Portland from storm surges. However, the islands are now at particular risk. The destruction of critical natural areas would result in a variety of compounded risks:

Climate change acts as a threat multiplier, undermining the supply of those ecosystem services, which can further endanger coastal communities' economies, culture, and resilience. For example, sea level rise and more intense storms might threaten wetland habitats. As wetlands are degraded, so too is the protective service they provide to people and property. Maintaining natural capital --the global stock of natural assets that provide beneficial services to people--to protect and support vibrant coastal communities is increasingly important as climate change impacts intensify.¹⁷²

The Coastal Zone Management Act and other environmental laws provide protections for Portland critical habitats, but stricter zoning could further protect those resources. Additional setback requirements, building restrictions, conservation easements and wetland restoration measures should be implemented for critical areas.

B. Addressing Social Justice Issues

It is apparent from the studies of recent natural disasters that the consequences of such events disproportionately affect certain communities more than others.¹⁷³ Accordingly, “[w]here climate change stresses settlements, it is likely to be especially problematic for vulnerable parts of the population: the poor, elderly, those already in poor health, the disabled, those living alone, those with limited rights and power (*e.g.*, recent immigrants with limited English [language] skills), and/or indigenous populations dependent on one or a few resources.”¹⁷⁴ Education plays an even more important role in addressing these social

172. *Id.* at 162.

173. See Alice Kaswan, *Domestic Climate Change Adaptation and Equity*, 42 ENVTL. L. REP. NEWS & ANALYSIS 11125, 11127 (2012).

174. *Id.* at 11126-27 (quoting U.S. CLIMATE CHANGE SCIENCE PROGRAM, *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems* 94 (2008), <http://www.climatechange.gov/Library/sap/sap4-6/final-report/>).

justice concerns, as information is likely to be less accessible to more isolated communities.

The East Bayside area in Portland is historically home to more vulnerable populations and is one of the areas most prone to flood risks. Thus, part of preparing Portland for sea level rise will require “climate change adaptation policies [that] grapple with the underlying socioeconomic inequities that exacerbate [the] vulnerability [of disadvantaged communities].”¹⁷⁵ In addition to the fact that disadvantaged communities are less likely to be financially able to fortify homes for disasters, to obtain adequate flood insurance, to have private transportation, and to have necessary emergency supplies, people who rent rather than own also generate further issues.¹⁷⁶ Such “[r]enters face special challenges in obtaining insurance and strengthening their homes, because renters have the right incentives but no control, while [the rental] property owners have control but less incentive.”¹⁷⁷ On a broader scale, sea level rise and changing weather patterns “create not only direct risks from flooding, but indirect risks from toxic contamination. Because poor and of-color communities are disproportionately located near industrial and waste disposal sites, these communities are likely to be disproportionately exposed to indirect contamination risks from contaminated floodwaters, residual contaminated sediments, and debris disposal.”¹⁷⁸ Given Portland’s combined sewage overflow system, this disproportionate impact is particularly concerning.

With regard to these issues, encouraging retreat through certain economic means could also have adverse effects on vulnerable populations. During the process of retreat, as areas become increasingly susceptible to flood risks, the value of properties in those areas will fall. Consequently, poor and minority households “would be more likely to move in as richer, white residents with greater housing mobility depart for safer ground. Given a restricted set of choices, low-income residents could rationally discount inchoate future risks in favor of short-term housing opportunities.”¹⁷⁹ It is clear that vulnerable populations are less likely to be able to withstand risks that surface from sea level rise; therefore, protection of areas with high concentrations of vulnerable populations should be prioritized in Portland. Commentators have noted that “[a]daptation policies that attempt to treat everyone the same, regardless

175. *Id.* at 11127.

176. *Id.* at 11129.

177. *Id.*

178. *Id.* at 11130.

179. *Id.* at 11134.

of underlying demographic characteristics, will result in substantial inequality given underlying differences. To achieve equitable adaptation, adaptation policies must explicitly address the demographics of affected populations and target interventions to address the needs of the most vulnerable populations.”¹⁸⁰ For Portland, taking steps to identify and prepare such communities will be crucial in the overall process of risk distribution. Land use regulations could offer protections to more vulnerable populations by configuring transportation, waste disposal systems, and other public resources in defense of highest risk areas. Implementing zoning restrictions on residential use in certain high-risk areas may also help mitigate the risk.

C. Restricting Further Development in High-Risk Areas

Despite the unpopularity of managed retreat, it will be crucial to disincentivize further development in the riskiest areas of Portland. Commercial Street, which is directly adjacent to the Atlantic Ocean, continues to see major developments and new building construction, despite the fact that it is already subject to serious flooding. Commercial Street and the immediate surrounding area are a center of economic activity and cultural significance in historic downtown Portland. Commercial Street “blurs the distinctions among working waterfront, downtown main street, and historic tourist district. It is a place where moored fishing boats, lobster pots and fishing gear, and crying seagulls mix with downtown office employees going to work, residents living in dockside condominiums, and tourists visiting restaurants and boutique shops.”¹⁸¹ In other words, the status of Commercial Street represents a dynamic intersection between economic hub, major tourist destination, residential area, and site of historic and cultural significance. In addition, the “privately owned and operated wharves that adjoin Commercial Street—more than a dozen altogether—are a source of much community pride, contributing to Portland's image as a self-reliant and viable seaport.”¹⁸² In the early 1990s, the city adopted new zoning regulations for the waterfront which attempted to balance the financial stability of commercial uses and the needs of the fishing and lobstering industry and

180. *Id.* at 11139.

181. *Commercial Street: Portland Maine*, AM. PLANNING ASS'N, <https://www.planning.org/greatplaces/streets/2008/commercialstreet.htm> (last visited Apr. 5, 2020), [<https://perma.cc/WYN4-J99T>].

182. *Id.*

Portland's image as a seaport.¹⁸³ It is clear that the waterfront and waterfront businesses play a crucial role in the image and economy of Portland. It is time at last, however, to implement immediate measures to slow development in this crucial sector of downtown Portland, as climate change related risks to the area become increasingly more apparent and urgent.

Limitations on development could be achieved through downzoning and zoning overlays. Additionally, economic impacts to developers could be minimized using transferrable development rights (TDRs). The system of transferable development rights is a way for the state to avoid:

payment for the owner's right to develop a particular piece of land by detaching these rights from the property itself and making them transferable—i.e., available for use by the owner, or by some other person who has purchased these rights from the owner for use on another piece of land that is available for further development.¹⁸⁴

The development of TDR programs was not originally in response to environmental concerns. The concept “was a response to the public need for the acquisition of certain lands in order to preserve them—or some of their aspects, historical, scenic or natural—for public enjoyment.”¹⁸⁵

TDRs are a potential way for governments to avoid takings. Implementing TDRs on property subject to heavy regulation would not force the property owner to lose all economic value in the land. However, implementation of TDR programs has not always been successful.¹⁸⁶ Although there have been efforts in Maine to adopt TDR mechanisms, “they have in large part been underutilized.”¹⁸⁷ Moreover, TDR programs have failed, even in Maine, “because they were either improperly designed or under-stimulated by market conditions.”¹⁸⁸ In addition, across the country, “TDRs have not been widely used in coastal areas, perhaps due to the slow political acceptance of the reality of sea level rise.”¹⁸⁹ However, TDRs could serve as an essential tool in the process of managed

183. *Id.*

184. 5 *Treatise on Environmental Law* § 10.03 (2019).

185. *Id.*

186. Lucy Friedman ET AL., *A Study of the Feasibility of a Transfer of Development Rights Program in Lewiston, Maine*, BATES COLLEGE SCARAB 2-5 (2014), https://scarab.bates.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1013&context=community_engaged_research [<https://perma.cc/D925-USGZ>].

187. *Id.* at 9.

188. *Id.* at 2.

189. Nicholas R. Williams, *Coastal TDRs and Takings in a Changing Climate*, 46 *Urb. Law.* 139, 141 (2014).

retreat, by increasing building heights for example. Unfortunately, the idea of increasing building height limits in Portland has not been popularly received.¹⁹⁰

Crafting a plan to discourage further development of non-marine businesses will be a delicate process given Portland's long-time strategy of mixing uses on the waterfront. Portland does appear to be on the right track in terms of limiting residential use and not allowing hotels directly on the waterfront.¹⁹¹ Although limiting high investment uses directly on the waterfront may be necessary, that is not to say that mixed use zoning should not be utilized at all in areas nearest to the waterfront. "When non-marine uses are permitted, these users are expected to reinvest in the working waterfront infrastructure, and some have done so by implementing green infrastructure in the Central Waterfront, including tree-box filters and bioswales to address stormwater issues."¹⁹²

Maintaining balanced development in Portland overall will be crucial in addressing economic changes. "Economic downturns, coupled with long-term declines in fishing and maritime industries, continue to challenge the feasibility of maintaining the waterfront's aging marine-related infrastructure."¹⁹³ The issues arising from instability of the fishing and marine industry will only continue to be "exacerbated by sea level rise, which now must be considered as part of the City's infrastructure (including working waterfront infrastructure) procurement process. Portland's innovative application of mixed-use zoning is an important strategy to help generate the funds needed to protect and maintain that built infrastructure, while protecting water-dependent uses."¹⁹⁴

Lobstering, for example, is an important part of Portland's economy. As a result of climate change, the lobster industry is changing and is expected to continue to change significantly. In 2019, the warming waters as a result of climate change gave rise to a spike in the lobster industry in

190. Marissa Bodnar, *Portland Developer Asks City to Change Zoning Rules, Allow Taller Buildings Downtown*, WGME (Dec. 20, 2019), <https://wgme.com/news/local/portland-developer-asks-city-to-change-zoning-rules-allow-taller-buildings-downtown> [https://perma.cc/37BX-CM4Z].

191. *Portland, Maine: Balancing Maritime Uses and Waterfront Diversification Through Municipal Zoning*, NATIONAL WORKING WATERFRONT NETWORK, https://nationalworkingwaterfronts.com/portfolio_page/case-study-portland-maine-balancing-maritime-uses-and-waterfront-diversification-through-municipal-zoning-portland-maine/ (last visited Apr. 5, 2020) [https://perma.cc/BQ3N-PXBA].

192. *Id.*

193. *Id.*

194. *Id.*

Maine.¹⁹⁵ The coastal waters of Maine became an ideal temperature for attracting lobsters.¹⁹⁶ However, because of the continuing changes in the ocean temperature, the lobsters are likely to move north as the temperature changes.¹⁹⁷ In terms of zoning Portland for sea level rise, the instability that will likely arise in the lobstering industry should be considered in order to utilize mixed use development to compensate for and to balance the economic changes. In other words, the stability provided from the balance of marine and non-marine businesses in the past will decrease as marine based businesses face new challenges. However, if the need for marine use development on the waterfront decreases, this could present an opportunity for government buyouts.

CONCLUSION

In conclusion, sea level rise and intensifying storms as a result of climate change pose serious and urgent flood risks to coastal communities. Coastal Maine areas, such as Portland, should be particularly concerned given the increased rate at which the Gulf of Maine is warming. Recent and unprecedented levels of flooding in Portland clearly render visible the beginnings of the increasingly destructive effects of climate change on coastal communities. In addition, Portland faces further risk relative to other port cities because it utilizes a combined sewer overflow system. The path forward for Portland will require further analysis of the economic relationship between marine businesses and non-marine businesses located in its downtown. As discussed, Portland has historically required a balance of those types of businesses to maintain economic stability. Though this balance must be maintained, the distribution of business types should be carefully planned in terms of risk. Residential uses should be discouraged in high-risk areas, particularly in low-income areas.

If viable, managed retreat as an option for Portland will have to be a slow process given the legal limitations on restricting land uses. However, this cannot be the sole solution. Overall policies must operate in tandem to move development inland, to increase natural water retention and drainage features, to protect critical environmental areas that have protected Portland, and to distribute risks to those most able to withstand such effects. Indubitably, land uses for maintaining public utilities, public

195. Rebecca Beitsch, *Changing Climate Boosts Maine Lobster Industry- For Now*, THE HILL (July 31, 2019), <https://thehill.com/policy/energy-environment/455415-changing-climate-boosts-maine-lobster-industry-for-now> [<https://perma.cc/X8BK-CWBH>].

196. *Id.*

197. *Id.*

services, emergency services, and residential uses should be relocated out of and barred from the most high-risk areas.

It is also essential for Portland to prepare for climate change flood risks by analyzing the environmental and social justice issues that are likely to arise as a result of these changes. Of particular concern should be the possibility that building seawalls or other barriers to protect expensive high development areas could divert more flooding to vulnerable areas.

In light of all these concerns and the lessons learned from storms such as Hurricane Katrina and Hurricane Sandy, protecting vulnerable populations must be a priority in order to mitigate the economic destruction and ethical injustices of potential flooding disasters. Strategic risk spreading and allocation would benefit the whole community.

Through the powerful tool of zoning, further development in the highest risk areas is preventable through TDRs and insurance restrictions by requiring new construction to be more flood resilient through higher elevation requirements, additional setbacks, use of flood resistant materials and designs, limiting impermeable surfaces, and incentivizing use of increased permeable surfaces such as green roofs or the development of other areas of planned planting to retain water. In addition, zoning laws represent an effective means to encourage development in safer areas. These strategies should be implemented to balance risk mitigation and the desires of the community and to continue Portland's waterfront activities and identity.