

# SEA GRANT LAW & POLICY JOURNAL

VOLUME 10:1

MONMOUTH SYMPOSIUM EDITION

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THE UNIVERSITY of  
**MISSISSIPPI**  
SCHOOL OF LAW

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# SEA GRANT LAW & POLICY JOURNAL

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## EDITOR'S NOTE

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Volume 10:1 of the Sea Grant Law & Policy Journal features articles from Monmouth University's "Climate Change, Coasts, and Communities" symposium on April 18, 2019. Also included in the edition are coastal adaptation articles from two Sea Grant Legal Network students: - Danielle Goshen and Julia M. Shelburne – who were both Georgia Sea Grant Legal Fellows.

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SYMPOSIUM ISSUE INTRODUCTION

Randall S. Abate<sup>1</sup>

On April 17-18, 2019, Monmouth University hosted the “Climate Change, Coasts, and Communities” symposium. Located just one mile from the Atlantic Ocean, the university’s picturesque campus offered an ideal setting for a robust discussion of the “new normal” of increased storm events, flooding, sea level rise, and coastal erosion due to climate change and how New Jersey can prepare for the daunting climate adaptation challenges that it faces in the years ahead. The symposium was hosted by Monmouth University’s Urban Coast Institute. It benefited from generous support from several co-sponsoring offices and organizations at Monmouth: the Global Education Office, the Wayne D. McMurray School of Social Sciences and the Humanities, the School of Science, the Political Science Department, and the Youth Activists Group.

The symposium assembled a distinguished and interdisciplinary collection of experts from the U.S. and Australia to address these issues from multiple perspectives. The two-day event kicked off with a student panel and an opening keynote presentation from Dr. Biliana Cicin-Sain of the Global Oceans Forum. The following day began with a breakfast keynote presentation on coastal climate adaptation in Australia by Prof. Jan McDonald of the University of Tasmania Law School, followed by three panels addressing climate change and the voiceless, coastal climate change adaptation, and climate change and anthropogenic eutrophication. It also featured a climate change and public health luncheon keynote presentation delivered by Prof. Robin Craig of the University of Utah S.J. Quinney School of Law.

The symposium website contains the event program with the full symposium agenda and speaker biographies. It also contains video recordings of the panels and keynote presentations, and presentations slides from all of the speakers. The website can be found at: <https://www.monmouth.edu/climate-coasts-communities/>.

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<sup>1</sup> Rechnitz Family / Urban Coast Institute Endowed Chair in Marine and Environmental Law and Policy; Professor, Department of Political Science and Sociology; and Director, Institute for Global Understanding, Monmouth University.

This special symposium issue of the SEA GRANT LAW & POLICY JOURNAL contains articles from three of the symposium speakers on pressing climate change adaptation challenges in various contexts. In her article, *Warming Oceans, Coastal Diseases, and Climate Change Public Health Adaptation*, Prof. Robin Craig addresses how a public health focused, disease risk approach can provide an effective focus for immediate coastal adaptation efforts by addressing real human needs and identifying practical “no regrets” first steps that can advance more general climate adaptation efforts.

Transitioning from U.S.-based to Australia-based coastal climate adaptation challenges, Prof. Jan McDonald addresses coastal adaptation planning in her article, *Girt by Sea: Antipodean Lessons in Coastal Adaptation Law*. She observes that there has been significant progress in Australia with precautionary planning and adaptive decision-making. Although entrenched interests continue to favor coastal development and protection of vulnerable property, she notes that these special interests appear to be loosening their grip on coastal adaptation policy. Her article reflects on barriers to future progress, noting the ongoing tensions between protecting public values and private property, and the problems associated with assigning adaptation decision-making to local government.

Finally, in his article, *Envisioning Nature’s Right to a Stable Climate System*, Grant Wilson, Esq., Executive Director and Directing Attorney of the Earth Law Center, offers an introduction to Rights of Nature principles and their potential to help address climate change. He first notes emerging climate change threats and underscores the failure of international law to adequately address climate change. He then argues that the Rights of Nature movement can serve as a useful tool to address climate change, such as by giving nature a voice at climate change negotiations. He concludes by identifying island nations as possible flag-bearers of one subset of the Rights of Nature movement and its relevance to promote climate adaptation.

WARMING OCEANS, COASTAL DISEASES, AND  
CLIMATE CHANGE PUBLIC HEALTH ADAPTATION

Robin Kundis Craig<sup>1</sup>

I. INTRODUCTION

As is true for most of the world, increasing numbers of people in the United States live along the coast.<sup>2</sup> Indeed, although shoreline counties constitute less than 10% of the total land area of the United States (not including Alaska), they already account for 39% of the total population.<sup>3</sup> That percentage has been increasing since at least 1970, with no end in sight.<sup>4</sup> As a result, when things go wrong along the coast or in the ocean, risks to the American public are correspondingly large.

Unfortunately, things *are* going wrong in the ocean. Changing ocean conditions resulting from climate change pose considerable public health risks to coastal populations that are relevant to coastal adaptation planning. While some of these risks take the form of increasing severe “natural” disasters like hurricanes,<sup>5</sup> ocean-related disease is also an increasing risk.

This article posits that an increased focus on the increasing risk of ocean-related disease could benefit coastal climate change adaptation efforts in many ways. First, disease and public health risks have an immediate political salience that other coastal climate risks, such as sea-level rise, do not. In addition, in several vulnerable coastal states, especially in the southeastern United States, public cognizance of increasing coastal disease risk might productively short-circuit debates over climate change itself (whether it is real and whether humans

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<sup>1</sup> James I. Farr Presidential Endowed Professor of Law, University of Utah S.J. Quinney College of Law. I thank Professor Randy Abate for inviting me to deliver a Keynote Address at Monmouth University’s “Climate Change, Coasts, and Communities” symposium on April 18, 2019. I would also like to thank my research assistant, Kayla Weiser Burton, for her research assistance for both my presentation and this article. Finally, this research was made possible, in part, through generous support from the Albert and Elaine Borchard Fund for Faculty Excellence. I may be reached at robin.craig@law.utah.edu.

<sup>2</sup> *What Percentage of the American population Lives Near the Coast?*, NAT’L OCEAN SERV., <http://oceanservice.noaa.gov/facts/population.html> (last visited Mar. 11, 2020).

<sup>3</sup> *Id.*

<sup>4</sup> *Id.*

<sup>5</sup> See generally Robin Kundis Craig, *Oceans and Coasts*, in CLIMATE CHANGE, PUBLIC HEALTH, AND THE LAW 204-240 (Michael Burger & Justin Gundlach, eds., 2018).

caused it) and coastal property rights in favor of actually dealing with these actual or potential public health problems.

Second, and relatedly, increasing coastal disease risk is a more immediate climate change impact than, say, coastal inundation. As the discussions below will make clear, diseases are already occurring as a result of the changing ocean, and many types of marine-related diseases have already increased their geographic ranges to invade previously “safe” coastal communities. As such, focusing public attention on this risk could increase public willingness to invest in coastal adaptation efforts immediately.

Finally, an increased focus on coastal disease risk could help to shift coastal planning from reactive to proactive adaptation efforts. Currently, most of the direct and physical threats to coasts from climate change prompt discussion about how to cope with those changes while largely preserving the status quo rather than true proactive adaptation efforts. For example, the risk of increasingly severe coastal storms tends to resonate in disaster preparedness frames, resulting in an inherently reactive mode of planning that focuses on being able to deal with such disasters as they occur. Identification of a disease risk, in contrast, generally shifts the conversation to prevention. In the coastal context, this shift in the discussion frame could in turn prompt increased attention to changing coastal ecosystems and habitats and provide impetus for thinking about coastal retreat and strategies to minimize disease-promoting habitat and human behaviors.

This Article proceeds in five parts. After this introduction, Part II will explore the disease risks that are increasing directly as a result of ocean warming, focusing on the spread of *Vibrio* bacteria and increased prevalence of harmful algal blooms, or HABs. Part III looks at increased disease risks from rising sea levels, generally in concert with increasing temperatures. It focuses on mosquito-borne diseases such as malaria and dengue fever. Part IV examines the most science-fiction-like potential for increased disease risk - melting ice around the world that exposes historical diseases, such as the 1918 pandemic flu virus. This Article concludes by summarizing the adaptation implications of these collective risks.

## II. DISEASE RISK #1: OCEAN WARMING

Increasing ocean temperature is the most basic marine consequence of climate change. Ocean warming has a number of follow-on effects. In the ocean itself, warming waters alter currents and induce marine species to shift their



ranges poleward, among other impacts. Warming ocean temperatures also change weather patterns worldwide and make hurricanes and typhoons more powerful.

Ocean warming also has a number of potential consequences in terms of marine-based disease. This Part will focus on two: the spread of marine *Vibrio* bacteria, including cholera; and the increase in harmful algal blooms (HABs).

#### A. Ocean Warming Because of Climate Change

In 2014, the Intergovernmental Panel on Climate Change (IPCC) published its Fifth Assessment Report on climate change.<sup>6</sup> The IPCC's reports are generally conservative, particularly where the ocean is concerned. Nevertheless, the Fifth Assessment Report provides a good starting assessment of the changes that have already occurred in the ocean, as well as projections for the future.

The world's ocean has been absorbing most - indeed, almost all - of the extra heat produced as a result of the increasing concentrations of greenhouse gases in the atmosphere, a function of the facts that water has a high heat capacity, the ocean has a large volume, and ocean currents can take heat to other places and deeper waters.<sup>7</sup> According to the IPCC:

Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (*high confidence*), with only about 1% stored in the atmosphere. On a global scale, the ocean warming is largest near the surface, and the upper 75 m[eters] warmed by 0.11 [0.09 to 0.13]°C per decade over the period 1971 to 2010. It is virtually certain that the upper ocean (0–700

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<sup>6</sup> The IPCC's Fifth Assessment Report consists of four documents: INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS (2013), *available at* <https://www.ipcc.ch/report/ar5/wg1/> (last visited Mar. 11, 2020); INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY (2014), *available at* <https://www.ipcc.ch/report/ar5/wg2/> (last visited Mar. 11, 2020); INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE (2014), *available at* <https://www.ipcc.ch/report/ar5/wg3/> (last visited Mar. 11, 2020); and INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: SYNTHESIS REPORT (2014), *available at* <https://www.ipcc.ch/report/ar5/syr/> (last visited Mar. 11, 2020) [hereinafter 2014 IPCC SYNTHESIS REPORT].

<sup>7</sup> *Ocean Warming*, OCEAN SCIENTISTS FOR INFORMED POLICY, <https://www.oceanscientists.org/index.php/topics/ocean-warming> (last visited Mar. 11, 2020).

m[eters]) warmed from 1971 to 2010, and it likely warmed between the 1870s and 1971.<sup>8</sup>

Ocean warming has continued to push deeper, and “[i]t is likely that the ocean warmed from 700 to 2000 m[eters] from 1957 to 2009 and from 3000 m[eters] to the bottom for the period 1992 to 2005.”<sup>9</sup>

Importantly, ocean warming will continue for many decades. According to the IPCC, “[t]he global ocean will continue to warm during the 21st century, with the strongest warming projected for the surface in tropical and Northern Hemisphere subtropical regions . . . .”<sup>10</sup> However, “[a]t greater depth the warming will be most pronounced in the Southern Ocean (*high confidence*),”<sup>11</sup> meaning that Antarctica might experience the most profound changes. A study published in *Nature* on, appropriately, Halloween 2018 indicated that the ocean is warming even faster than the IPCC suggested.<sup>12</sup> While calculation errors immediately came to light that called into question the most extreme of the authors’ estimations, the study’s main conclusion - that the ocean is warming faster than the IPCC had indicated - remains valid.<sup>13</sup>

#### B. A Warming Ocean and *Vibrio* Bacteria

Among the beneficiaries of a warming ocean are several species of *Vibrio*, which are “rod-shaped bacteria that are natural constituents of estuarine and marine environments.”<sup>14</sup> The genus *Vibrio* contains over 100 species, about a dozen of which can cause human disease.<sup>15</sup> The most common ways of getting a vibriosis infection are either by eating contaminated seafood (usually shellfish) or

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<sup>8</sup> 2014 IPCC SYNTHESIS REPORT, *supra* note 5, at 4.

<sup>9</sup> *Id.* at 40.

<sup>10</sup> *Id.* at 11.

<sup>11</sup> *Id.* at 60.

<sup>12</sup> L. Resplandy et al., *Quantification of Ocean Heat Uptake from Changes in Atmospheric O<sub>2</sub> and CO<sub>2</sub> Composition*, 563 NATURE 105, 105-07 (2018), available at <https://doi.org/10.1038/s41586-018-0651-8> (last visited Mar. 11, 2020).

<sup>13</sup> Christa Marshall, *High-profile Ocean Warming Paper to Get a Correction*, E&E NEWS, Nov. 14, 2018, available at <https://www.sciencemag.org/news/2018/11/high-profile-ocean-warming-paper-get-correction> (last visited Mar. 11, 2020).

<sup>14</sup> Craig Baker-Austin et al., *Non-Cholera Vibrios: The Microbial Barometer of Climate Change*, 25 TRENDS IN MICROBIOLOGY 76, 76 (2017), available at <https://www.sciencedirect.com/science/article/pii/S0966842X16301408> (last visited Mar. 11, 2020).

<sup>15</sup> *Id.*

through infection of an open wound while swimming or wading in the ocean.<sup>16</sup> Pathogenic *Vibrio* species replicate in as little as eight or nine minutes, making them some of the most adaptable bacteria on the planet.<sup>17</sup>

Four disease-causing forms of *Vibrio* are considered most important from a public health perspective.<sup>18</sup> The first is *Vibrio vulnificus*, which “colonize[s] filter feeding animals such as oysters, crabs and mussels, but can also be found free-living in seawater.”<sup>19</sup> In terms of human disease, *V. vulnificus* is mostly a food-borne pathogen. “Indeed, 95% of fatalities linked to seafood consumption in the USA are caused by this bacterium, underlying its importance as a key foodborne pathogen.”<sup>20</sup> However, while “[m]ost people become infected with *V. vulnificus* through eating raw shellfish,” the bacterium “can also cause wound infections where an open wound is exposed to seawater.”<sup>21</sup> In addition to unpleasant but less serious effects, septicemia leading to amputation or death is one potential outcome from either route of infection.<sup>22</sup>

The disease potential of *Vibrio vulnificus* appears to be linked to sea temperature, and throughout the 20th century most identified infections occurred along the very warm Gulf of Mexico, especially in Florida. However, the emergence of *Vibrio vulnificus* disease in other parts of the world, notably Israel, has been linked to climate change and increasing temperatures.<sup>23</sup> Similarly, in the United States in the early 21st century, there has been an increase in the number of *Vibrio vulnificus* infections along the Atlantic coast, stretching as far north as Delaware, New Jersey, and Rhode Island, linked to increasing sea temperatures.<sup>24</sup>

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<sup>16</sup> *Id.*

<sup>17</sup> *Id.*

<sup>18</sup> *Id.* at 77.

<sup>19</sup> CARINA BLACKMORE, FLA. DIV. OF DISEASE CONTROL, VIBRIO VULNIFICUS 1 (1999), <http://www.floridahealth.gov/diseases-and-conditions/vibrio-infections/documents/Vibrio-vulnificus.pdf> (last visited Mar. 11, 2020).

<sup>20</sup> Baker-Austin et al., *supra* note 14, at 77.

<sup>21</sup> BLACKMORE, *supra* note 18, at 1.

<sup>22</sup> *Id.*

<sup>23</sup> Shlomit Paz et al., *Climate Change and the Emergence of Vibrio vulnificus Disease in Israel*, 103 ENVTL. RES. 390, 390-91 (2007), <https://doi.org/10.1016/j.envres.2006.07.002> (last visited Mar. 11, 2020).

<sup>24</sup> Jessica Forbes, *Vibrio Bacteria a Bigger Threat to Swimmers than Sharks as Northern Waters Warm*, FRIENDS OF THE IRISH ENVIRONMENT, May 30, 2008, <https://www.friendsoftheirishenvironment.org/fie-work/27-papers-today/global-warming/11699-> (last visited Mar. 11, 2020).

Another *Vibrio* species, *V. parahaemolyticus*, “is the most prevalent food-poisoning bacterium associated with seafood consumption and typically causes acute gastroenteritis.”<sup>25</sup> Like *V. vulnificus*, this species appears to be spreading with warming seas - for example, it recently showed up for the first time along the northeast coast of the United States.<sup>26</sup> Public health officials around the world have reported large-scale outbreaks of *V. parahaemolyticus* infection over the last two decades, and “a highly pathogenic variant . . . emerged on the west coast of the United States during an unusually warm spring” and then migrated to the east coast and Europe in 2012.<sup>27</sup>

The third *Vibrio* species of concern in warming waters is *Vibrio alginolyticus*. “An often overlooked bacterium, *V. alginolyticus* is increasingly recognized as an emerging human pathogen, and as with other *vibrios* the incidence of infection significantly increases during summer months. *V. alginolyticus* is ubiquitous in sea water and tends to cause superficial wound and ear infections . . . .”<sup>28</sup> In Florida over the decade from 1998 to 2007, *V. alginolyticus* caused almost 20% of vibriosis infections, and these kinds of infections appear to be increasing in the United States.<sup>29</sup>

The most notorious disease-causing *Vibrio*, however, is *Vibrio cholerae*, which causes cholera. Cholera outbreaks are “associated with drinking or bathing in unpurified river or brackish water” but also appear to be linked to climate and temperature.<sup>30</sup> Moreover, *Vibrio cholerae* has a sea stage, during which copepods (a type of tiny animal, or zooplankton) act as host organisms. According to researchers investigating the link between climate change and cholera, “[c]limate, seasonal weather changes and seasonal changes in ocean currents affect the growth of copepods.”<sup>31</sup> Thus, researchers hope that by measuring ocean parameters such as temperature and plankton blooms, they will be able to provide “an early warning system for cholera, enabling an effective deployment of resources to minimize or prevent cholera epidemics . . . .”<sup>32</sup>

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<sup>25</sup> Baker-Austin et al., *supra* note 14, at 78.

<sup>26</sup> *Id.* at 77.

<sup>27</sup> *Id.* at 78.

<sup>28</sup> *Id.* at 79 (citations omitted).

<sup>29</sup> *Id.*

<sup>30</sup> Brad Lobitz et al., *Climate and Infectious Disease: Use of Remote Sensing for Detection of Vibrio Cholerae by Indirect Measurement*, 97 PROC. NAT'L ACAD. SCI. 1438, 1438 (2000).

<sup>31</sup> Rita R. Colwell, *A Voyage of Discovery: Cholera, Climate, and Complexity*, 4 ENVTL. MICROBIOLOGY 67, 67 (2002).

<sup>32</sup> Lobitz et al., *supra* note 30, at 1438.

Cholera-carrying copepods “live[] in salt or brackish waters, including rivers and ponds, and travel[] with currents and tides. Copepods harbour both dormant, nutrient-deprived and culturable *Vibrio*. The bacteria can survive as an inactive sporelike form - dormant but still infectious - in the gut and on the surfaces of copepods in between epidemics.”<sup>33</sup> Moreover, ships transport a very large number of these copepods in ballast water.<sup>34</sup>

Evidence indicates that “cholera outbreaks occur shortly after sea-surface temperature and sea-surface height are at their zenith.”<sup>35</sup> Perhaps not coincidentally, therefore, within the same time frame that climate change has begun to affect ocean temperatures and ocean currents, cholera has re-emerged in epidemic form in the coastal areas of Southeast Asia, Central America, and South America.<sup>36</sup>

Indeed, there is considerable evidence that a warming ocean is increasing coastal populations’ disease risk from all the *Vibrio* species. In 2016, for example, a team of researchers noted the:

unprecedented number of domestically acquired human infections that occurred in Northern European countries and were associated with swimming/bathing in coastal waters. Most of these cases were reported during heat waves (e.g., 1994, 1997, 2003, 2006, 2010), and it is expected that, as global warming continues, such events are likely to increase in frequency and intensity. Besides human illnesses, evidence has also been gathered linking *Vibrio* infections to increasing mass mortality of marine life in the coastal marine environment.<sup>37</sup>

Vibriosis infections are also of increasing concern in the United States. As researchers summarized in 2017:

Cases of *Vibrio* infections have a marked seasonal distribution - most occur during summer and early autumn, corresponding to the

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<sup>33</sup> Colwell, *supra* note 31, at 68.

<sup>34</sup> *Id.*

<sup>35</sup> *Id.* at 67.

<sup>36</sup> *Id.*

<sup>37</sup> Luigi Vezzulli, et al., *Climate Influence on Vibrio and Associated Human Diseases During the Past Half-century in the Coastal North Atlantic*, 113 PROC. NAT’L ACAD. SCI. E5062, E5062 (2016), <https://doi.org/10.1073/pnas.1609157113> (last visited Mar. 11, 2020).

period of warmer temperatures. Several reports have recently indicated that human *Vibrio* illnesses are increasing worldwide, including fatal acute diarrheal diseases, such as gastroenteritis, and wound infections and septicemia. A number of significant factors underpin the need for a greater understanding of these food borne pathogens within an international context: compared to other major food borne pathogens, the number of *Vibrio* infections is steadily increasing. Indeed, the Centers for Disease Control and Prevention (CDC) estimates that the average annual incidence of all *Vibrio* infections increased by 41% between 1996 and 2005 in the USA.<sup>38</sup>

In addition, *Vibrio* infections are now occurring in new locations suggestive of a warmth-driven expansion in range,<sup>39</sup> and climate change projections indicate that the risk of *Vibrio* infection will continue to increase because of a longer transmission season and an expanding geographical range as the ocean continues to warm.<sup>40</sup>

### C. A Warming Ocean and Harmful Algal Blooms

A warming ocean also promotes harmful algal blooms, or HABs. Algae are marine plants, many of which are beneficial to marine food webs.<sup>41</sup> Marine algae include both the large marine seaweeds and kelp and the nearly microscopic algal forms of marine phytoplankton.<sup>42</sup> The small phytoplanktonic forms of algae can create an “algal bloom,” which “is a rapid increase in the population of algae in an aquatic system. . . . Typically only one or a few phytoplankton species are involved and some blooms may be recognized by discoloration of the water resulting from the high density of pigmented cells.”<sup>43</sup> This discoloration can give

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<sup>38</sup> Baker-Austin et al., *supra* note 14, at 76 (citations omitted).

<sup>39</sup> *Id.* at 76-77.

<sup>40</sup> Jan C. Semenza, *Environmental Suitability of Vibrio Infections in a Warming Climate: An Early Warning System*, 125(10) ENVTL. HEALTH PERSPECTIVES 1, 5 (2017), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5933323/> (last visited Mar. 11, 2020).

<sup>41</sup> *What Is a Harmful Algal Bloom?*, NAT’L OCEANOGRAPHIC & ATMOSPHERIC ADMIN., <https://www.noaa.gov/what-is-harmful-algal-bloom> (last visited Mar. 11, 2020).

<sup>42</sup> *Id.*

<sup>43</sup> *Reference Terms: Algal Bloom*, SCIENCEDAILY, [https://www.sciencedaily.com/terms/algal\\_bloom.htm](https://www.sciencedaily.com/terms/algal_bloom.htm) (last visited Mar. 11, 2020).

algal blooms common names, such as “red tides.”<sup>44</sup> Increasing nutrient concentrations are the usual cause of algal blooms.<sup>45</sup>

A HAB, in turn, is a bloom of a species of algae phytoplankton that is harmful in some way.<sup>46</sup> With respect to human health, the most important HABs are those that “produce toxins that can kill fish, mammals and birds, and may cause human illness or even death in extreme cases.”<sup>47</sup> For example, sea lions in California have died when blooms of certain marine algae produce domoic acid.<sup>48</sup>

Public health officials most commonly recognize five HAB-related human illnesses.<sup>49</sup> First, “[i]t is generally well-accepted that ciguatera fish poisoning (CFP) is the most frequently reported seafood-related disease in the United States and most common foodborne illness related to finfish consumption in the world.”<sup>50</sup> CFP occurs when people consume fish - generally tropical reef species - “that have accumulated potent neurotoxins (ciguatoxin) in their flesh and viscera. The toxins are produced by the marine dinoflagellate *Gambierdiscus spp.*,” which live in coral reef ecosystems.<sup>51</sup> “More than 400 fish species are thought to have the potential for ciguatera toxicity.”<sup>52</sup> Herbivorous fish eat the dinoflagellates (a form of algal phytoplankton<sup>53</sup>), and the ciguatoxin accumulates in their flesh, concentrating up the food web to apex-level predators.<sup>54</sup> As a result, “[t]he risk is greatest for carnivorous, predatory fish, such as barracuda (of which >70% may be toxic). Other high risk fish include snapper, grouper, and amberjack.”<sup>55</sup> CFP generally causes severe gastrointestinal problems that abate within twenty-four hours, but it can also cause cardiovascular and neurological issues, sometimes leading to respiratory distress, coma, and death.<sup>56</sup>

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<sup>44</sup> DANIELLE HALL, SMITHSONIAN OCEAN WHAT EXACTLY IS A RED TIDE?, (2018), available at <https://ocean.si.edu/ocean-life/plants-algae/what-exactly-red-tide> (last visited Mar. 16, 2020).

<sup>45</sup> *Id.*

<sup>46</sup> *What Is a Harmful Algal Bloom?*, *supra* note 41.

<sup>47</sup> *Id.*

<sup>48</sup> *The Rising Tide of Ocean Plagues: How Humans are Changing the Dynamics of Disease*, EUREKALERT!, Feb. 17, 2006 [hereinafter EUREKALERT],

[http://www.eurekalert.org/pub\\_releases/2006-02/s-trt021206.php](http://www.eurekalert.org/pub_releases/2006-02/s-trt021206.php) (last visited Mar. 11, 2020).

<sup>49</sup> Lynn M. Grattan et al., *Harmful Algal Blooms and Public Health*, 57 HARMFUL ALGAE 2, 3 (2016), available at <http://dx.doi.org/10.1016/j.hal.2016.05.003> (last visited Mar. 11, 2020).

<sup>50</sup> *Id.* (citations omitted).

<sup>51</sup> *Id.*

<sup>52</sup> *Id.* (citations omitted).

<sup>53</sup> *What Is a Harmful Algal Bloom?*, *supra* note 41.

<sup>54</sup> Grattan et al., *supra* note 49, at 3.

<sup>55</sup> *Id.* (citations omitted).

<sup>56</sup> *Id.* (citations omitted).

Second, Paralytic Shellfish Poisoning (PSP) results from “eating bivalve mollusks (mussels, scallops, clams) contaminated with a group of structurally related marine toxins collectively referred to as saxitoxins.”<sup>57</sup> Mollusks consume the various dinoflagellates that produce these toxins during red tides, concentrating the saxitoxins in their flesh.<sup>58</sup> As a result, mollusk predators like lobsters can also convey the toxins to humans.<sup>59</sup>

Geographically, the most risky regions for PSP are temperate and tropical marine coasts. In North America, this includes Alaska, the Pacific Northwest, and the St. Lawrence region of Canada; however, incidents of PSP regularly occur in the Philippines and other tropical regions. Toxic shellfish have also been found in temperate regions of southern Chile, England, Japan, and the North Sea.<sup>60</sup>

PSP symptoms start with numbness or tingling around the mouth, which in more severe cases can “spread to the neck and face, and may be accompanied by headache, abdominal pain, nausea, vomiting, diarrhea, and a wide range of neurologic symptoms. These neurologic symptoms may include weakness, dizziness, dysarthria, paresthesia, double vision, loss of coordination, vertigo or dizziness, and/or a ‘floating’ sensation.”<sup>61</sup>

Third, another red tide shellfish risk is Neurotoxic Shellfish Poisoning (NSP).<sup>62</sup> People typically get NSP “by ingesting bivalve shellfish (e.g., clams, oysters and mussels) that are contaminated with brevetoxins.”<sup>63</sup> In the United States, strict prohibitions on commercial shellfish harvests during and after red tides mean that most NSP cases come from recreational harvesters, although NSP risks are increasing as the brevetoxin-generating HABs migrate to new coastlines.<sup>64</sup> “In fact, the largest number of reported U.S. cases came from a single outbreak of forty-eight persons in North Carolina as a result of the

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<sup>57</sup> *Id.* (citations omitted).

<sup>58</sup> *Id.* (citations omitted).

<sup>59</sup> *Id.* (citation omitted).

<sup>60</sup> *Id.*

<sup>61</sup> *Id.*

<sup>62</sup> *Id.* at 5 (citations omitted).

<sup>63</sup> *Id.*

<sup>64</sup> *Id.*



transportation of brevetoxin-producing organisms up the eastern seaboard.”<sup>65</sup> NSP symptoms include both gastrointestinal and neurological problems.<sup>66</sup> The latter are of more concern and can “include paresthesia of the mouth, lips, and tongue; peripheral tingling, partial limb paralysis, slurred speech, dizziness, ataxia, and a general loss of coordination.”<sup>67</sup> In 2018, Florida’s southwest coast experienced a nine-month-long, 100-mile-long, brevetoxin-producing red tide in which the brevetoxins aerosolized, causing more health problems.<sup>68</sup> This HAB “caused the death of thousands of marine animals, *induced respiratory issues in six Florida counties near the Gulf of Mexico*, forced the closure of several beaches, and negatively affected tourism across the southwest Florida coast.”<sup>69</sup>

Fourth, HABs that produce domoic acid can lead to Amnesic Shellfish Poisoning (ASP).<sup>70</sup> Researchers first discovered this HAB risk to human health in 1987 in eastern Canada, where the people who ate contaminated blue mussels from Prince Edward Island suffered gastrointestinal distress and, in a few cases, death.<sup>71</sup> Some of the survivors, however, suffered from the memory disorder that gives ASP its name.<sup>72</sup> New regulations require shellfish beds to be closed when domoic acid levels reach twenty parts per million, but domoic acid levels have been increasing in many places, including along the United States’ Pacific coast.<sup>73</sup> Blooms of *Pseudonitzschia* produce the domoic acid, which shellfish then concentrate in their tissues. In late 2018, Dungeness crab fishermen in California and Oregon sued thirty fossil-fuel energy companies over the increasing domoic acid problem, blaming the companies for their role in promoting climate change, which is in turn promoting these HABs.<sup>74</sup> However, the bigger seafood problem may be razor clams, because “they can hold the toxin for up to one year in the natural environment, or several years after being processed, canned, or frozen.”<sup>75</sup>

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<sup>65</sup> *Id.* (citation omitted).

<sup>66</sup> *Id.*

<sup>67</sup> *Id.*

<sup>68</sup> Priya Shukla, *Why Is Florida Experiencing Its Most Toxic Algae Bloom In a Decade?*, FORBES, Aug. 10, 2018, <https://www.forbes.com/sites/priyashukla/2018/08/10/why-is-florida-experiencing-its-most-toxic-algae-bloom-in-a-decade/#fe7aa28587e1> (last visited Mar. 11, 2020).

<sup>69</sup> *Id.* (emphasis added).

<sup>70</sup> Grattan et al., *supra* note 49, at 5.

<sup>71</sup> *Id.*

<sup>72</sup> *Id.*

<sup>73</sup> *Id.*

<sup>74</sup> Jason Daley, *Crab Fishermen Sue Energy Companies Over Climate Change*, SMITHSONIAN SMART NEWS, Dec. 5, 2018, <https://www.smithsonianmag.com/smart-news/crab-fishermen-sue-energy-companies-over-climate-change-180970957/> (last visited Mar. 11, 2020).

<sup>75</sup> Grattan et al., *supra* note 49, at 5.

Finally, Diarrhetic Shellfish Poisoning (DSP) is caused by okadaic acid and related toxins that a variety of dinoflagellates produce when they bloom, “most notably, *Dinophysis* spp and *Prorocentrum* spp.”<sup>76</sup> “Mussels, clams, scallops and oysters are the most common vectors for the DSP toxins,” and “[o]utbreaks of DSP have been reported in the U.S., Japan, France and other parts of Europe, Canada, New Zealand, United Kingdom, and South America.”<sup>77</sup> The first confirmed case of DSP in the United States was in 2011 from mussels harvested in Sequim Bay, Washington, but cases have since arisen in Texas and New York, “suggesting that a ‘tipping point’ was exceeded across the U.S., allowing these toxins to affect several coastal regions that historically have not been impacted by them.”<sup>78</sup> As the name suggests, the main symptom of DSP “is incapacitating diarrhea, followed by nausea, vomiting, and abdominal cramps”; the disease can lead to dehydration, and the toxins may cause longer-term health problems.<sup>79</sup>

“Every U.S. coastal and Great Lakes state experiences HABs.”<sup>80</sup> Two of the biggest promoters of HABs are warm ocean temperatures and nutrient concentrations.<sup>81</sup> Climate researchers expect coastal HABs to increase in both frequency and intensity, both because ocean temperatures are increasing and because higher levels of nutrient pollution are entering the marine system.<sup>82</sup> As one group of researchers summarized in 2016, “With the dramatic increase in the number of harmful algal blooms, as well as their frequency and intensity in coastal regions throughout the world, there are more toxic algal species, more algal toxins, and more geographic areas affected than ever before.”<sup>83</sup> Exposure risks are also increasing: “The risk of HAB-related illnesses is further amplified

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<sup>76</sup> *Id.* (citations omitted).

<sup>77</sup> *Id.* at 5-6 (citations omitted).

<sup>78</sup> *Id.* at 6 (citations omitted).

<sup>79</sup> *Id.* (citations omitted).

<sup>80</sup> *What Is a Harmful Algal Bloom?*, *supra* note 41.

<sup>81</sup> *Id.*; EUREKALERT, *supra* note 48.

<sup>82</sup> MICHAEL N. MOORE ET AL., LINKING OCEANS AND HUMAN HEALTH: A STRATEGIC RESEARCH PRIORITY FOR EUROPE (POSITION PAPER 19 OF THE EUROPEAN MARINE BOARD) 25 (2013), *available at* <http://marineboard.eu/sites/marineboard.eu/files/public/publication/Oceans%20and%20Human%20Health-214.pdf> (last visited Mar. 11, 2020); Ana C. Dvorak et al., *Possible Impacts of Sea Level Rise on Disease Transmission and Potential Adaptation Strategies, a Review*, 217 J. ENVTL. MGMT. 951, 955 (2018), *available at* <https://www.sciencedirect.com/science/article/pii/S0301479718303359?via%3Dihub> (last visited Mar. 11, 2020).

<sup>83</sup> Grattan et al., *supra* note 49, at 2.

by shifting preferences to heart healthy diets, increased travel to coastal destinations, increased consumption of imported fish, the growth of coastal urban communities, and growing segments of the population involved in marine recreation.”<sup>84</sup> As a result of both sets of factors, environmental and exposure, “it is anticipated that the number of cases of HAB-related illnesses will continue to rise over the next decade.”<sup>85</sup>

### III. DISEASE RISK #2: SEA-LEVEL RISE

Sea-level rise presents a number of risks to coastal communities, including inundation of farmland and water supplies with salt water and increased storm surge.<sup>86</sup> In terms of disease, however, sea-level rise is important mainly because it expands the habitat available to pathogens or disease-carrying vectors. For example, global sea level rise is projected to flood lower-elevation coastal areas, expanding the estuarine and brackish environments that provide ideal habitat for the pathogenic *Vibrio* species discussed in Part I.<sup>87</sup> This Part, however, focuses on mosquito-borne diseases.

#### A. Climate Change and Sea-Level Rise

While local conditions can vary considerably, global average sea levels are clearly rising. According to the IPCC in 2014, “Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21] m[eters].”<sup>88</sup> The ocean has been rising faster since the mid-19th century than it had risen over the previous 2000 years,<sup>89</sup> and “[i]t is *likely* that extreme sea levels (for example, as experienced in storm surges) have increased since 1970, being mainly a result of rising mean sea level.”<sup>90</sup> The IPCC also concluded that:

It is *very likely* that the mean rate of global averaged sea level rise was 1.7 [1.5 to 1.9] mm/yr between 1901 and 2010 and 3.2 [2.8 to 3.6] mm/yr between 1993 and 2010. Tide gauge and satellite altimeter data are consistent regarding the higher rate during the

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<sup>84</sup> *Id.* (citation omitted).

<sup>85</sup> *Id.* at 3.

<sup>86</sup> Craig, *supra* note 5, at 208-10, 222-29.

<sup>87</sup> Semenza, *supra* note 40, at 6.

<sup>88</sup> *Id.* at 4.

<sup>89</sup> *Id.* at 4.

<sup>90</sup> *Id.* at 8.

latter period. It is *likely* that similarly high rates occurred between 1920 and 1950.<sup>91</sup>

Sea-level rise has two main components: melting land-based ice (glaciers and ice shelves) and expanding volume as the ocean warms. The two contributors to sea level rise have been roughly equal until recently, although melting ice and disintegrating ice shelves are becoming more important contributors.<sup>92</sup> According to the IPCC,

Since the early 1970s, glacier mass loss and ocean thermal expansion from warming together explain about 75% of the observed global mean sea level rise (*high confidence*). Over the period 1993–2010, global mean sea level rise is, with *high confidence*, consistent with the sum of the observed contributions from ocean thermal expansion, due to warming, from changes in glaciers, the Greenland ice sheet, the Antarctic ice sheet and land water storage . . . .<sup>93</sup>

Sea-level rise will continue to accelerate through the 21st century and beyond.<sup>94</sup> According to the IPCC, “For the period 2081–2100 relative to 1986–2005,” global average sea level will rise somewhere between one-quarter and four-fifths of a meter.<sup>95</sup> Moreover, “[b]y the end of the 21st century, it is very likely that sea level will rise in more than about 95% of the ocean area. About 70% of the coastlines worldwide are projected to experience a sea level change within  $\pm 20\%$  of the global mean.”<sup>96</sup> However, sea-level rise will not be uniform across regions. For example, “[s]ince 1993, the regional rates for the Western Pacific are up to three times larger than the global mean, while those for much of the Eastern Pacific are near zero or negative.”<sup>97</sup>

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<sup>91</sup> *Id.* at 42.

<sup>92</sup> Mark F. Meier et al., *Glaciers Dominate Eustatic Sea-Level Rise in the 21st Century*, 317 *SCIENCE* 1064, 1065 (2007) (arguing that glaciers and ice caps “contribute about 60% of the eustatic, new-water component of sea-level rise”).

<sup>93</sup> 2014 IPCC SYNTHESIS REPORT, *supra* note 6, at 42.

<sup>94</sup> *Id.* at 13.

<sup>95</sup> *Id.* at 13.

<sup>96</sup> *Id.*

<sup>97</sup> *Id.* at 42.

## B. Sea-Level Rise and Mosquito-Borne Disease in the United States

Humans suffer from a variety of vector-borne diseases - this is, diseases that require contact with an animal or insect for human infection to occur. Climate change affects most vector-borne diseases, and in a number of ways. The most certain of these impacts include the geographic shift of both vectors and reservoirs as a result of temperature change; the alteration of development, survival, and reproduction rates of vectors, reservoirs, and pathogens; and the inducement of changes in human behavior that amplify the risk of infection.<sup>98</sup> For example, in terrestrial northern latitudes, warming temperatures are allowing animal and insect disease vectors to shift north, effectively expanding their ranges and increasing the chances that humans will be infected<sup>99</sup> with diseases such as West Nile Virus.<sup>100</sup>

Mosquitoes are common transmitters of vector-borne diseases, “including malaria, lymphatic filariasis and dengue with recently estimated prevalence of 247, 120 and 50 million cases worldwide respectively.”<sup>101</sup> In general, with respect to insect vectors such as ticks and mosquitoes, a warmer climate provides more favorable conditions for both vector and pathogen survival.<sup>102</sup> Indeed, warmer temperatures can actually speed up ticks’ and mosquitoes’ life cycles<sup>103</sup> and can lengthen the season in which mosquitoes are active.<sup>104</sup> In some places, warming

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<sup>98</sup> Audrey Waits et al., *Human Infectious Diseases and the Changing Climate in the Arctic*, 121 ENVTL. INT’L 703, 705 (2018), available at <https://www.sciencedirect.com/science/article/pii/S0160412018312005> (last visited Mar. 11, 2020); Jonathan A. Patz et al., *Climate Change Challenges and Opportunities for Global Health*, 312 J. AMER. MED. ASS’N 1565, 1572 (2014), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6108836/> (last visited Mar. 11, 2020); Tony McMichael et al., *Health Risks, Present and Future, From Global Climate Change*, BMJ 2 (2012), available at <https://www.bmj.com/content/344/bmj.e1359> (last visited Mar. 11, 2020).

<sup>99</sup> Waits et al., *supra* note 98, at 705.

<sup>100</sup> Scott C. Weaver & William K. Reisen, *Present and Future Arboviral Threats*, 85 ANTIVIRAL RES. 328, 331 (2010), available at <https://www.sciencedirect.com/science/article/pii/S0166354209004951> (last visited Mar. 11, 2020).

<sup>101</sup> Ranjan Ramasamy & Sinnathamby N. Surendran, *Possible Impact of Rising Sea Levels on Vector-borne Infectious Diseases*, 11 BMC INFECTIOUS DISEASES 1, 1 (2011), available at <https://bmcinfectdis.biomedcentral.com/track/pdf/10.1186/1471-2334-11-18> (last visited Mar. 11, 2020).

<sup>102</sup> *Id.*

<sup>103</sup> *Id.*; see also Waits et al., *supra* note 98, at 705.

<sup>104</sup> Dvorak et al., *supra* note 82, at 955.

temperatures now allow mosquitoes to survive the winter.<sup>105</sup> A 2018 Climate Central study of 244 U.S. cities found that 229 of them - 94% - already faced increased risks of mosquito-borne diseases simply as a result of having more warm days each year.<sup>106</sup> Few of the top ten cities are coastal - San Francisco, California, is the notable exception - but the report also notes that “[a]s climate change increases temperatures during winter months, transmission could become possible year-round in some places across the continental U.S., beginning with South Florida.”<sup>107</sup> The report further notes that “[t]he land area of the U.S. most suitable for *Aedes albopictus* mosquitoes is projected to increase from 5 percent to about 50 percent by 2100, putting 60 percent of the northeastern U.S. population at risk for the diseases carried by this mosquito, including West Nile virus, dengue and Zika.”<sup>108</sup>

Heat is not the only factor influencing the spread of mosquito-borne disease, however. Unlike ticks, mosquitoes require water to breed, and some species of disease-bringing mosquitoes already prefer brackish or saline water.<sup>109</sup> In addition, non-vector freshwater mosquito species have developed tolerances for brackish water in India, Sri Lanka, and western Australia, causing concern that their disease-bearing relatives could do the same.<sup>110</sup> Together, these factors mean that sea-level rise is also a factor in mosquito-borne disease risk - a factor that differentially impacts coastal communities.

“Rising sea levels will affect the extent of saline (>30 parts per thousand or ppt salt) or brackish (0.5-30 ppt salt) water bodies in coastal areas.”<sup>111</sup> As James Titus has noted, “[b]y deepening shallow bodies of water, a sea level rise could cause them to stagnate.”<sup>112</sup> Warm, stagnant bodies of brackish water are perfect breeding grounds for disease-bearing mosquitoes. As a result, and

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<sup>105</sup> Waits et al., *supra* note 98, at 705.

<sup>106</sup> JULIA LANGER, ABBEY DUFOE, & JEN BRADY, CLIMATE CENTRAL, U.S. FACES A RISE IN MOSQUITO ‘DISEASE DANGER DAYS’ 2 (2018), available at [http://assets.climatecentral.org/pdfs/August2018\\_CMN\\_Mosquitoes.pdf?pdf=Mosquitoes-Report](http://assets.climatecentral.org/pdfs/August2018_CMN_Mosquitoes.pdf?pdf=Mosquitoes-Report) (last visited Mar. 11, 2020). Interestingly, many of the cities that are becoming *less* risky for mosquito-borne disease, like Phoenix, Arizona, are shedding risk days because they are becoming *too hot* for mosquitoes, *id.* at 3, leading to other health concerns.

<sup>107</sup> *Id.* at 4 & tbl. 1.

<sup>108</sup> *Id.* at 5.

<sup>109</sup> Ramasamy & Surendran, *supra* note 101, at 2.

<sup>110</sup> *Id.* at 2-3.

<sup>111</sup> *Id.* at 2.

<sup>112</sup> James G. Titus, *Greenhouse Effect, Sea Level Rise, and Land Use*, 7 LAND USE POL’Y 138, 145 (1990).

especially in combination with higher temperatures, sea-level rise in coastal areas will contribute to the expected resurgence of mosquito-borne diseases such as malaria and the introduction of new mosquito-borne diseases, such as dengue fever.

Worldwide, both malaria and dengue fever are spreading, both by emerging into new areas and by returning to areas where the diseases had been under control. For example, the World Health Organization (WHO) reported in December 2016 that “[i]n 2015, there were roughly 212 million malaria cases and an estimated 429 000 malaria deaths” worldwide.<sup>113</sup> Moreover, malaria has returned to countries like Peru, largely as a result of climate change and deforestation.<sup>114</sup> Peru almost eradicated malaria forty years ago, but in 2008 64,000 cases were registered in the country, half in the Amazon region.<sup>115</sup> Public health officials believe that there were many more unregistered cases deep within the massive and humid rainforest, where health authorities find it almost impossible to gain access.<sup>116</sup>

Malaria is also endemic in the United States, if currently essentially eradicated.<sup>117</sup> According to the Centers for Disease Control (CDC), “About 1,700 cases of malaria are diagnosed in the United States each year. The vast majority of cases in the United States are in travelers and immigrants returning from countries where malaria transmission occurs, many from sub-Saharan Africa and South Asia.”<sup>118</sup> In contrast, “Outbreaks of locally transmitted cases of malaria in the United States have been small and relatively isolated,” generally resulting from “airport malaria,” where mosquitoes unintentionally flown to the United States on planes from malaria-endemic countries infect people here; congenital malaria, where an infected mother transmits the malaria parasite to a fetus during pregnancy; and the rare case of malaria transmission through a blood transfusion,

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<sup>113</sup> *Malaria*, WORLD HEALTH ORG., <https://www.who.int/features/factfiles/malaria/en/> (last visited Mar. 11, 2020).

<sup>114</sup> Andrés Schipani & John Vidal, *Malaria Moves in Behind the Loggers*, THE GUARDIAN, Oct. 30, 2007, <http://www.guardian.co.uk/world/2007/oct/30/environment.climatechange> (last visited Mar. 11, 2020).

<sup>115</sup> *Id.*

<sup>116</sup> *Id.*

<sup>117</sup> *The History of Malaria, an Ancient Disease*, CTR. FOR DISEASE CONTROL AND PREVENTION, [http://www.cdc.gov/malaria/history/eradication\\_us.htm](http://www.cdc.gov/malaria/history/eradication_us.htm) (last visited Mar. 11, 2020).

<sup>118</sup> *About Malaria*, CTR. FOR DISEASE CONTROL AND PREVENTION <https://www.cdc.gov/malaria/about/> (last visited Mar. 11, 2020).

which occurs about once every two years.<sup>119</sup> Even so, the CDC warns that “the potential risk for the disease to re-emerge is present due to the abundance of competent vectors, especially in the southern states,”<sup>120</sup> and the resurgence of malaria in Peru provides a cautionary note for the United States.

Public health officials generally consider dengue fever the most important mosquito-borne disease.<sup>121</sup> It has no treatment, can be deadly, and according to the WHO, “[d]uring the past five decades, the incidence of dengue has increased 30-fold. Some 50–100 million new infections are estimated to occur annually in more than 100 endemic countries, with a documented further spread to previously unaffected areas; every year hundreds of thousands of severe cases arise, including 20,000 deaths.”<sup>122</sup> Dengue fever epidemics are currently spreading through South America.<sup>123</sup> A study published in June 2019 in *Nature Microbiology*:

estimated that more than two billion additional people could be at risk for dengue in 2080 compared with 2015 under a warming scenario roughly representative of the world's current emissions trajectory. That increase largely comes from population growth in areas already at high risk for the disease, as well as the expansion of dengue’s range.<sup>124</sup>

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<sup>119</sup> *Malaria Transmission in the United States*, CTR. FOR DISEASE CONTROL AND PREVENTION, [https://www.cdc.gov/malaria/about/us\\_transmission.html](https://www.cdc.gov/malaria/about/us_transmission.html) (last visited Mar. 11, 2020).

<sup>120</sup> *Id.*

<sup>121</sup> Natasha Evelyn Anne Murray et al., *Epidemiology of Dengue: Past, Present and Future Prospects*, 5 *CLINICAL EPIDEMIOLOGY* 299, 303–04 (2013), available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3753061/> (last visited Mar. 11, 2020).

<sup>122</sup> WORLD HEALTH ORG., GLOBAL STRATEGY FOR DENGUE PREVENTION AND CONTROL 2012-2020 1 (2012) (citations omitted), [https://apps.who.int/iris/bitstream/handle/10665/75303/9789241504034\\_eng.pdf;jsessionid=7E2153F3CC6B299C4FCE4E3EFBB7F7A4?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/75303/9789241504034_eng.pdf;jsessionid=7E2153F3CC6B299C4FCE4E3EFBB7F7A4?sequence=1) (last visited Mar. 12, 2020).

<sup>123</sup> Marcela Valente, *South America: Climate Change Fuels Spread of Dengue Fever*, INTER PRESS SERVICE, Mar. 19, 2007, <http://www.ipsnews.net/2007/03/south-america-climate-change-fuels-spread-of-dengue-fever/> (last visited Mar. 12, 2020).

<sup>124</sup> Kendra Pierre-Louis & Nadja Popovich, *How Dengue, a Deadly Mosquito-Borne Disease, Could Spread in a Warming World*, THE NEW YORK TIMES, June 10, 2019, <https://www.nytimes.com/interactive/2019/06/10/climate/dengue-mosquito-spread-map.html> (last visited Mar. 12, 2020). The study discussed in the article is: Moritz U. G. Kraemer et al., *Past and Future Spread of the Arbovirus Vectors Aedes aegypti and Aedes albopictus*, 4 *Nature Microbiology* 854, 854–63 (2019), available at <https://doi.org/10.1038/s41564-019-0376-y> (last visited Mar. 12, 2020).



Those at risk now include some residents of the United States. As with malaria, currently most U.S. residents who contract dengue fever were infected somewhere else,<sup>125</sup> although the CDC notes that “[d]engue is common in the US territories of Puerto Rico, the US Virgin Islands, and American Samoa.”<sup>126</sup> Increasing incidents of native infection cases are also occurring in the states - namely, Hawai’i, Texas, and Florida. Dengue was present in Hawai’i until 1944, but no locally transmitted outbreaks occurred between 1944 and 2001.<sup>127</sup> In 2001-2002, however, 122 people on Maui, Oahu, and Kauai became infected with the dengue virus, followed by outbreaks in 2011 on Oahu and 2015-2016 on the Big Island, in which 256 people contracted dengue fever.<sup>128</sup> In Texas, “Sporadic outbreaks have occurred in the Gulf coastal area and in extreme south Texas.”<sup>129</sup> These include cases in 2005 and an outbreak of eighteen cases in 2013, both in the southernmost counties of Texas.<sup>130</sup> As in Hawai’i, dengue had been present in Florida into the 20th century, but public health officials eliminated it by 1934.<sup>131</sup> However:

In 2009-2010, an outbreak of dengue was identified in Key West. A total 22 persons were identified with dengue fever in Key West during the summer and fall of 2009. In 2010, 66 cases of locally acquired dengue associated with Key West were reported in Florida with onset dates between March and November 2010.<sup>132</sup>

In 2013, twenty-eight residents of Martin County, Florida, were infected with the dengue virus, twenty-four of whom developed dengue fever symptoms and six of

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<sup>125</sup> *Dengue Fever*, FLA. DEPT. OF HEALTH, <http://www.floridahealth.gov/diseases-and-conditions/dengue/> (last visited Mar. 12, 2020); *Dengue Fever FAQs*, TEX. DEP’T OF HEALTH & HUMAN SERV., <https://www.dshs.texas.gov/idcu/disease/dengue/information/faqs/> (last visited Mar. 12, 2020).

<sup>126</sup> *Dengue in the US States and Territories*, CTR. FOR DISEASE CONTROL, <https://www.cdc.gov/dengue/areaswithrisk/in-the-us.html> (last visited Mar. 12, 2020).

<sup>127</sup> Robert Herriman, *Hawaii Dengue Outbreak Tops 2001 Outbreak*, OUTBREAK NEWS TODAY, Dec. 5, 2015, <http://outbreaknewstoday.com/hawaii-dengue-outbreak-tops-2001-outbreak-36619/> (last visited Mar. 12, 2020).

<sup>128</sup> Meghan Ross, *6 Facts to Know About Hawaii’s Dengue Fever Outbreak*, PHARMACY TIMES, Feb. 16, 2016, <https://www.pharmacytimes.com/news/6-facts-to-know-about-hawaiis-dengue-fever-outbreak> (last visited Mar. 12, 2020).

<sup>129</sup> *Dengue Fever FAQs*, *supra* note 126.

<sup>130</sup> Dine Fine Maron, *Dengue Fever Reemerges in Texas*, SCIENTIFIC AMERICAN, Nov. 18, 2013, available at <https://blogs.scientificamerican.com/observations/dengue-fever-reemerges-in-texas/> (last visited Mar. 12, 2020).

<sup>131</sup> *Dengue Fever*, *supra* note 126.

<sup>132</sup> *Id.*

whom had to be hospitalized.<sup>133</sup> Miami-Dade County has reported twenty-one cases of dengue fever in the last decade, including in November 2018, while Broward County has had four cases.<sup>134</sup>

Thus, dengue fever is an existing and probably expanding risk in the United States. Indeed, the June 2019 study predicted that dengue fever would spread along the Gulf and Atlantic coasts of the United States by 2080.<sup>135</sup>

#### IV. DISEASE RISK #3: ICE MELTING

As Planet Earth warms, ice is melting. The loss of land-based ice in Greenland and Antarctica and various coastal glaciers are contributing to global sea-level rise, and that contribution is likely to increase as this century progresses. The melting ice also poses a disease risk, however - one that may be particularly important to coastal communities.

##### A. Climate Change and Ice Melt

A warming atmosphere and ocean are accelerating ice melt - but exactly how badly remains climate change's greatest uncertainty. For example, the unexpectedly increasing pace of polar ice melt has added significant volatility to the art of sea level rise prediction.<sup>136</sup> Studies repeatedly indicate that the Greenland ice sheet and Antarctic ice are melting faster than expected,<sup>137</sup> and an August 2007 study published in *Science* suggested "that future sea-level rise may be larger than anticipated and that the component due to GIC [glaciers and ice caps] will continue to be substantial."<sup>138</sup> The IPCC noted in 2014 that "[o]ver the period 1992 to 2011, the Greenland and Antarctic ice sheets have been losing

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<sup>133</sup> FLA. DEPT. OF HEALTH, MARTIN COUNTY DENGUE OUTBREAK AND SEROSURVEY 1 (2013), available at <http://www.floridahealth.gov/diseases-and-conditions/dengue/documents/mc-dengue-survey-summary-june2014.pdf> (last visited Mar. 12, 2020).

<sup>134</sup> *Florida's First Case of Dengue Fever in 2018 Confirmed*, NEWS@THEU, Nov. 20, 2018, <https://news.miami.edu/stories/2018/11/floridas-first-case-of-dengue-fever-in-2018-confirmed.html> (last visited Mar. 12, 2020).

<sup>135</sup> Kendra Pierre-Louis & Nadja Popovich, *How Dengue, a Deadly Mosquito-Borne Disease, Could Spread in a Warming World*, THE NEW YORK TIMES, June 10, 2019, <https://www.nytimes.com/interactive/2019/06/10/climate/dengue-mosquito-spread-map.html> (last visited Mar. 12, 2020).

<sup>136</sup> Anny Cazenave, *How Fast Are the Ice Sheets Melting?*, 314 SCIENCE 1250, 1250-51 (2006).

<sup>137</sup> *Id.* at 1251; J.L. Chen, et al., *Satellite Gravity Measurements Confirm Accelerated Melting of Greenland Ice Sheet*, 313 SCIENCE 1958, 1958 (2006).

<sup>138</sup> Meier et al., *supra* note 92, at 1066.

mass (*high confidence*), likely at a larger rate over 2002 to 2011. Glaciers have continued to shrink almost worldwide (*high confidence*).<sup>139</sup> It projects that these ice sheets and glaciers will continue to decrease throughout the 21st century, shrinking by 15% to 85% by 2100.<sup>140</sup> Beyond this century:

The threshold for the loss of the Greenland ice sheet over a millennium or more, and an associated sea level rise of up to 7 m[eters], is greater than about 1°C (*low confidence*) but less than about 4°C (*medium confidence*) of global warming with respect to pre-industrial temperatures. Abrupt and irreversible ice loss from the Antarctic ice sheet is possible, but current evidence and understanding is insufficient to make a quantitative assessment.<sup>141</sup>

NASA confirms that the planet is losing ice at an increasing rate: “Data from NASA's GRACE satellites show that the land ice sheets in both Antarctica . . . and Greenland . . . have been losing mass since 2002. Both ice sheets have seen an acceleration of ice mass loss since 2009.”<sup>142</sup> Indeed, Antarctica’s melting has been accelerating, with a melt rate as much as 280% greater in 2019 than in 1979.<sup>143</sup>

If the Greenland ice sheet melts entirely, sea level will rise up to seven meters (twenty-three feet).<sup>144</sup> The West Antarctic Ice Sheet contains enough ice to raise sea level by five to seven meters (17-23 feet).<sup>145</sup> If all of Antarctica melts, sea level will rise approximately sixty meters, or almost 200 feet.<sup>146</sup> If both

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<sup>139</sup> 2014 IPCC SYNTHESIS REPORT, *supra* note 6, at 4.

<sup>140</sup> *Id.* at 12.

<sup>141</sup> *Id.* at 16.

<sup>142</sup> *Vital Signs of the Planet: Facts*, NAT’L AERONAUTICS AND SPACE ADMIN., <https://climate.nasa.gov/vital-signs/ice-sheets/> (last visited Mar. 12, 2020).

<sup>143</sup> Brandon Miller, *Antarctica Ice Melt has Accelerated 280% in Last 4 Decades*, CNN, Jan. 14, 2019, <https://www.cnn.com/2019/01/14/world/climate-change-antarctica-ice-melt-twin-studies/index.html> (last visited Mar. 12, 2020).

<sup>144</sup> VIVIAN GORNITZ, GODDARD INSTITUTE FOR SPACE STUDIES, NAT’L AERONAUTICS AND SPACE ADMIN., SEA LEVEL RISE, AFTER THE ICE MELTED AND TODAY (2007), *available at* [http://www.giss.nasa.gov/research/briefs/gornitz\\_09/](http://www.giss.nasa.gov/research/briefs/gornitz_09/) (last visited Mar. 12, 2020).

<sup>145</sup> *Id.*; *see also* Daniel Glick, *The Big Thaw*, NAT’L GEOGRAPHIC, June 22, 2019, <https://www.nationalgeographic.com/environment/global-warming/big-thaw/> (last visited Mar. 12, 2020) (“If the West Antarctic ice sheet were to break up, which scientists consider very unlikely this century, it alone contains enough ice to raise sea level by nearly 20 feet (6 meters)”).

<sup>146</sup> ANTARCTIC TREATY CONSULTATIVE MEETING XXIX, THE ANTARCTIC AND CLIMATE CHANGE 3 (2006).

Greenland and Antarctica melt completely, sea level would rise about sixty-five meters,<sup>147</sup> or approximately 215 feet.

However, sea-level rise is not the only risk that melting ice may bring. Melting ice may also expose the world to old diseases.

B. It Sounds Like Science Fiction, But . . .

Melting ice could potentially expose people to long-forgotten diseases. In 2006, Dr. Scott Rogers, a Bowling Green State University biologist, reported “the potential for long-dormant strains of influenza, packed in ice in remote global outposts, to be unleashed by melting and migratory birds.”<sup>148</sup> As a result, melting ice could expose human populations to strains of flu, such as the virus that caused the 1918 flu pandemic, against which human immunity has died out.<sup>149</sup> Dr. Rogers contends this “information could be used to help develop inoculation strategies for the future.”<sup>150</sup>

This concern, it must be admitted, sounds like science fiction. However, ice-based disease transmission appears to have already occurred. In August 2016, a twelve-year-old boy died from and at least twenty other people living on the Yamal Peninsula, Siberia, were hospitalized with anthrax, infected when melting permafrost exposed an infected reindeer that had been frozen for about seventy-five years.<sup>151</sup>

If a melting Antarctica is the source of most concern for sea-level rise, a melting Arctic - where humans have been living for perhaps as long as 45,000

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<sup>147</sup> Cazenave, *supra* note 137, at 1250.

<sup>148</sup> *Flu Can Bide Time in Icy Limbo Before Re-Emerging, Biologist Believes*, SCIENCE DAILY, Nov. 28, 2006, <http://www.sciencedaily.com/releases/2006/11/061127210430.htm> (last visited Mar. 12, 2020).

<sup>149</sup> *Id.*

<sup>150</sup> *Id.*

<sup>151</sup> Jasmin Fox-Skelly, *Long-dormant Bacteria and Viruses, Trapped in Ice and Permafrost for Centuries, are Reviving as Earth's Climate Warms*, BBC EARTH, May 4, 2017, available at <http://www.bbc.com/earth/story/20170504-there-are-diseases-hidden-in-ice-and-they-are-waking-up> (last visited Mar. 12, 2020). See also Boris A. Revich & Marina A. Podolnaya, *Thawing of Permafrost May Disturb Historic Cattle Burial Grounds in East Siberia*, 4 GLOBAL HEALTH ACTION 1, 1-7 (detailing the increasing risk of anthrax infections in cattle and reindeer as a result of melting permafrost).

years<sup>152</sup> - is where the disease risk lies. Human remains in the Arctic can harbor diseases. As one example,

in the 1890s there was a major epidemic of smallpox in Siberia. One town lost up to 40% of its population. Their bodies were buried under the upper layer of permafrost on the banks of the Kolyma River. 120 years later, Kolyma's floodwaters have started eroding the banks, and the melting of the permafrost has speeded up this erosion process.<sup>153</sup>

Moreover, permafrost can preserve those diseases for a *very* long time. “Frozen permafrost soil is the perfect place for bacteria to remain alive for very long periods of time, perhaps as long as a million years. That means melting ice could potentially open a Pandora’s box of diseases.”<sup>154</sup>

This assertion isn’t just theory. As early as 1951, scientists found the 1918 H1N1 pandemic influenza virus in frozen corpses in Alaska, which they and later scientists could then study both *in vitro* and *in vivo*, including sequencing its genome in 2005.<sup>155</sup> In 2005, NASA scientists published the successful efforts to revive a 32,000-year old bacterium, *Carnobacterium pleistocenium*, that they found in permafrost in Fox Tunnel, Alaska.<sup>156</sup> *Carnobacterium* species are anaerobic and may help transform oxygenated aquatic environments to anaerobic conditions.<sup>157</sup> Some species can cause disease in fish.<sup>158</sup> Two years later, a different team of researchers published the report of their successful revival of bacteria found in Antarctic ice estimated to be 100,000 and 8 million years old.<sup>159</sup>

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<sup>152</sup> Ann Gibbons, *Grisly Find Suggests Humans Inhabited Arctic 45,000 Years Ago*, SCIENCE, Jan. 14, 2016, <https://www.sciencemag.org/news/2016/01/grisly-find-suggests-humans-inhabited-arctic-45000-years-ago> (last visited Mar. 12, 2020).

<sup>153</sup> Fox-Skelly, *supra* note 152.

<sup>154</sup> *Id.*

<sup>155</sup> Jeffery K Taubenberger et al., *Discovery and Characterization of the 1918 Pandemic Influenza Virus in Historical Context*, 12 ANTIVIRUS THEORY 581, 581-91 (2007).

<sup>156</sup> Elena V. Pikuta et al., *Carnobacterium Pleistocenium Sp. Nov., a Novel Psychrotolerant, Facultative Anaerobe Isolated from Permafrost of the Fox Tunnel in Alaska*, 55 INTL. J. SYSTEMIC & EVOLUTIONARY MICROBIOLOGY 473, 473-78 (2005).

<sup>157</sup> *Id.* at 473.

<sup>158</sup> *Id.*

<sup>159</sup> Kay D. Bidle et al., *Fossil Genes and Microbes in the Oldest Ice on Earth*, 104 PROC. NATL. ACAD. SCI. 13455, 13455-60 (2007), <https://doi.org/10.1073/pnas.0702196104> (last visited Mar. 12, 2020).

The authors speculated that such bacteria may have been important to the Earth's evolutionary history:

The community DNA immobilized in Antarctic ice is essentially a “gene popsicle,” which can potentially be acquired by extant organisms upon thawing. Given the widespread influence of lateral gene transfer (LGT) within microbial populations and its putative influence on the tempo of microbial evolution, one can envision periods in Earth's history when large numbers of ancient genes became available as ice sheets melted. Indeed, the tempo of evolution after major global glaciations appears to have increased dramatically, although causal mechanisms have been poorly defined.<sup>160</sup>

While none of these revived ancient bacteria apparently pose any threat to humans, their revival does validate the hypothesis that old bacterial diseases could also emerge from the ice. The disease-causing bacteria most likely to survive in ice for lengthy times are those that form spores, like anthrax, “tetanus and *Clostridium botulinum*, the pathogen responsible for botulism . . . .”<sup>161</sup>

Viruses can also emerge from permafrost and become infectious. A 2014 study, for instance, reported that a French team of scientists had isolated a 30,000-year-old giant virus, *Pithovirus sibericum*, from Siberian permafrost.<sup>162</sup> The virus was still infectious - albeit only to amoeba.<sup>163</sup> Still, as the authors noted:

Climate change in the Russian Arctic is more evident than in many other regions of the world. . . . This no doubt corresponded to a large release of micro-organisms from previously frozen soils, an unknown fraction of which was revived upon thawing. Indeed, pathogenic bacteria can survive under low temperatures recurrently causing diseases in circumpolar regions.<sup>164</sup>

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<sup>160</sup> *Id.* at 13458 (citations omitted).

<sup>161</sup> Fox-Skelly, *supra* note 152.

<sup>162</sup> Matthieu Legendrea et al., *Thirty-thousand-year-old Distant Relative of Giant Icosahedral DNA Viruses with a Pandoravirus Morphology*, 111 PROC. NATL. ACAD. SCI. 4274, 4274-79 (2007), available at [www.pnas.org/cgi/doi/10.1073/pnas.1320670111](http://www.pnas.org/cgi/doi/10.1073/pnas.1320670111) (last visited Mar. 12, 2020).

<sup>163</sup> *Id.* at 4278.

<sup>164</sup> *Id.* (citations omitted).

They further concluded that scientists and public health officials should be interested in exploring further what exactly is emerging from the permafrost.<sup>165</sup> As others have speculated, “We could even see viruses from long-extinct hominin species like Neanderthals and Denisovans, both of which settled in Siberia and were riddled with various viral diseases.”<sup>166</sup>

A melting Arctic comes with other consequences relevant to disease risk, like increasing sea access and interest in Arctic trade and development, including commercial fishing,<sup>167</sup> oil and gas development,<sup>168</sup> and international shipping.<sup>169</sup> More people using the coasts of the Arctic region means increased human exposure to whatever pathogens emerge from Arctic ice, both because more people risk exposure in the Arctic itself and because more people will be traveling from the Arctic via the ocean to other coasts. Ships’ ballast water and other features have long transported invasive species around the globe,<sup>170</sup> and if the Age of Discovery (or the contemporary COVID-19 pandemic) proved anything, it was that sailors (and cruise ship passengers) are excellent vectors for introducing new diseases to other parts of the planet.<sup>171</sup>

## V. CONCLUSION

The disease risks to coastal communities from climate change are not trivial, and increasing numbers of these communities are likely to be coping with diseases that they’ve never seen before, or seen during only the warmest of El Niño or other ocean oscillation events. Whether communities are adequately monitoring and training for these emerging and resurging diseases is an open question, but there are reasons to doubt. With respect to mosquito-borne diseases,

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<sup>165</sup> *Id.* at 4278-79.

<sup>166</sup> Fox-Skelly, *supra* note 152.

<sup>167</sup> *E.g.*, Ivan Stupachenko, *Can Russia’s Arctic Deliver on Big Fishing Promises?*, April 4, 2018, SEAFOODSOURCE, <https://www.seafoodsource.com/features/can-russias-arctic-deliver-on-big-fishing-promises> (last visited Mar. 12, 2020).

<sup>168</sup> For example, in 2017 President Trump attempted to open the United States’ portion of the Arctic Ocean to oil and gas leasing, but in late March 2019, a federal judge ruled the Executive Order unlawful. *League of Conservation Voters v. Trump*, 363 F. Supp. 3d 1013, 1020-31 (D. Alas. 2019).

<sup>169</sup> Jessica Murphy, *Is the Arctic Set to Become a Main Shipping Route?*, BBC NEWS, Nov. 1, 2018, <https://www.bbc.com/news/business-45527531> (last visited Mar. 12, 2020).

<sup>170</sup> *Ballast Water & Invasive Species*, ECOCHLOR, <https://ecochlor.com/ballastWaterInvasiveSpecies.html> (last visited Mar. 12, 2020).

<sup>171</sup> Nathan Nunn & Nancy Qian, *The Columbian Exchange: A History of Disease, Food, and Ideas*, 24 J. ECON. PERSPECTIVES 163, 163-64, 165-66 (2010).

for example, “[b]rackish/saline water bodies are frequently neglected in vector control programs.”<sup>172</sup>

These new disease risks do give coastal communities reason to re-evaluate their approaches to climate change adaptation. For example, as sea-level rise creates new habitat for *Vibrios* and disease-bearing mosquitoes, coastal communities can take “steps to reduce the development of new coastal swamps and other potential brackish/saline water breeding sites, and tidal flows in estuaries.”<sup>173</sup> Disease risk also means that climate change adaptation planning and implementation cannot rest solely in the hands of traditional coastal zone managers and land use planners or focus only on the *physical* impacts of climate change. Instead, adaptation efforts must include public health agencies, agriculturists and irrigators, livestock agencies and ranchers, and ecosystem stewards, among many others.<sup>174</sup>

Relatedly, increasing and changing coastal disease risk has the potential to make climate change real and adaptation strategies necessary in coastal communities that have largely ignored their climate change vulnerabilities. It also has the potential to shift adaptation focus and financing in communities that have been emphasizing physical impacts and strategies, such as seawalls to address sea-level rise. Indeed, increased cognizance of climate change coastal disease risk may ultimately aid coastal communities in seriously addressing coastal retreat strategies<sup>175</sup> earlier rather than later - after all, who wants to live next to a sea that can increasingly threaten your health, and in some particularly nasty ways?

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<sup>172</sup> Ramasamy & Surendran, *supra* note 101, at 4.

<sup>173</sup> *Id.*

<sup>174</sup> *Id.*

<sup>175</sup> *See generally* ANNE SIDER, MANAGED COASTAL RETREAT: A LEGAL HANDBOOK ON SHIFTING DEVELOPMENT AWAY FROM VULNERABLE AREAS (2013), available at <http://columbiaclimatelaw.com/files/2016/11/Siders-2013-10-Managed-Coastal-Retreat.pdf> (last visited Mar. 12, 2020).



GIRT BY SEA: ANTIPODEAN LESSONS IN COASTAL ADAPTATION LAW

Jan McDonald<sup>1</sup>

I. INTRODUCTION

Australia is an island nation, ‘girt by sea’.<sup>2</sup> The coast plays a fundamental role in Australia’s national identity, economy, and cultural and social life,<sup>3</sup> as well as providing critical ecosystem goods and services.<sup>4</sup> Since European colonization, sections of Australia’s eastern seaboard have undergone intensive development, from Melbourne in the south to Cairns, in Far North Queensland. Over 80% of Australia’s population currently lives within fifty kilometers of the coast.<sup>5</sup> Coastal values are already at risk from a range of hazards,<sup>6</sup> but while Australia’s coast experiences periodic damage from tropical cyclones, east-coast lows, or mid-latitude depressions,<sup>7</sup> it has yet to experience the large-scale erosion or inundation that has occurred in parts of Europe or the Atlantic and Gulf Coasts of the United States.<sup>8</sup>

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<sup>1</sup> Professor Jan McDonald, School of Law and Centre for Marine Socioecology, University of Tasmania, Australia.

<sup>2</sup> PETER DODDS MCCORMICK, ADVANCE AUSTRALIA FAIR (1878), selected as Australia’s national anthem in 1984.

<sup>3</sup> GRAEME F. CLARK & EMMA L. JOHNSTON, AUSTRL. GOV’T DEP’T OF THE ENV’T AND ENERGY, AUSTRALIA STATE OF THE ENVIRONMENT 2016: COASTS, INDEPENDENT REPORT TO THE AUSTRALIAN GOVERNMENT MINISTER FOR ENVIRONMENT AND ENERGY 2 (2017).

<sup>4</sup> *Id.*; VICTORIAN COASTAL COUNCIL, DEP’T OF ENV’T & PRIMARY INDUST., VICTORIAN COASTAL STRATEGY 2014 13–15, [hereinafter VICTORIAN COASTAL STRATEGY 2014], [https://www.marineandcoasts.vic.gov.au/\\_data/assets/pdf\\_file/0025/405835/VCS\\_2014.pdf](https://www.marineandcoasts.vic.gov.au/_data/assets/pdf_file/0025/405835/VCS_2014.pdf) (last visited Mar. 10, 2020); Marcus Sheaves et al., *Principles for Operationalizing Climate Change Adaptation Strategies to Support the Resilience of Estuarine and Coastal Ecosystems: An Australian Perspective*, 68 MARINE POL’Y 229 (2016).

<sup>5</sup> Clark & Johnston, *supra* note 3, at 54–99. *See also*, AUSTL. DEP’T OF CLIMATE CHANGE, CLIMATE CHANGE RISKS TO AUSTRALIA’S COAST: A FIRST PASS NATIONAL ASSESSMENT (2009), [http://www.climatechange.gov.au/sites/climatechange/files/documents/03\\_2013/cc-risks-full-report.pdf](http://www.climatechange.gov.au/sites/climatechange/files/documents/03_2013/cc-risks-full-report.pdf) (last visited Mar. 10, 2020); AUSTL. DEP’T OF CLIMATE CHANGE, ENVIRONMENT AND ENERGY, CLIMATE CHANGE RISKS TO COASTAL BUILDINGS AND INFRASTRUCTURE: A SUPPLEMENT TO THE FIRST PASS NATIONAL ASSESSMENT (2011).

<sup>6</sup> Clark & Johnston, *supra* note 3, at 54–99.

<sup>7</sup> ANDREW D. SHORT & COLIN D. WOODROFFE, THE COAST OF AUSTRALIA (2009).

<sup>8</sup> Orrin H. Pilkey & Andrew G. Cooper, *Society and Sea Level Rise*, 303 SCIENCE 1781 (2004); U.S. CLIMATE CHANGE SCIENCE PROGRAM, COASTAL SENSITIVITY TO SEA-LEVEL RISE: A FOCUS ON THE MID-ATLANTIC REGION (2009).

Australia's existing coastal vulnerability will be exacerbated by climate change.<sup>9</sup> Slow-onset sea level rise, more severe storms, and the combination of these slow and extreme events, will accelerate coastal erosion and shoreline recession, and cause both gradual inundation and temporary flooding in Australia and worldwide.<sup>10</sup> Assessments of the likely impacts of climate change on Australia's coasts estimate that over US\$200 billion in infrastructure is exposed to erosion or inundation, with associated implications for the provision of essential services, such as electricity, water, transport, and water management.<sup>11</sup> A third of the estimated 711,000 homes located in Australian coastal zones risk inundation with a 1.1 meter sea level rise (the revised projection for 2100).<sup>12</sup>

Any increase in coastal hazards will have significant economic, social, and of course, ecological impacts. The importance of Australia's coastal zone and its vulnerability to climate change impacts make climate change adaptation a high priority for coastal decision-makers across municipal and state-level urban and spatial planning, as well as natural resource and infrastructure agencies.<sup>13</sup> The impacts on local communities and property owners also means that coastal

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<sup>9</sup> *Summary for Policymakers, in*, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY. PART A: GLOBAL AND SECTORAL ASPECTS. CONTRIBUTION OF WORKING GROUP II TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 1-32 (C.B., et al., eds., 2014) [hereinafter CLIMATE CHANGE 2014]; Stephane Hallegatte et al., *Future Flood Losses in Major Coastal Cities*, 3 NATURE CLIMATE CHANGE 802 (2013).

<sup>10</sup> The Intergovernmental Panel on Climate Change's Fifth Assessment Report (IPCC AR5) predicted future sea level rise of 0.26–0.98 m by 2100. CLIMATE CHANGE 2014, *supra* note 9, at 374; Kathleen McInnes et al., *Information for Australian Impact and Adaptation Planning in Response to Sea-level Rise*, 65 AUSTRALIAN METEOROLOGICAL & OCEANOGRAPHIC JOURNAL 127–149 (2015). In 2019, the IPCC increased the projected upper limit to 1.1m, to reflect observed acceleration of sea level. *Summary for Policymakers, in* IPCC SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE (H.-O. Pörtner, et al., eds. 2019), available at [https://report.ipcc.ch/srocc/pdf/SROCC\\_SPM\\_Approved.pdf](https://report.ipcc.ch/srocc/pdf/SROCC_SPM_Approved.pdf) (last visited Mar. 10, 2019).

<sup>11</sup> Michael Bradley, Ingrid van Putten & Marcus Sheaves, *The Pace and Progress of Adaptation: Marine Climate Change Preparedness in Australia's Coastal Communities*, 53 MARINE POL'Y 13 (2015); VICTORIAN COASTAL STRATEGY 2014, *supra* note 4, at 17–24.

<sup>12</sup> See AUSTL. GOV'T DEP'T OF CLIMATE CHANGE, CLIMATE CHANGE RISKS TO AUSTRALIA'S COAST (2009), available at <https://www.environment.gov.au/system/files/resources/fa553e97-2ead-47bb-ac80-c12adffea944/files/cc-risks-full-report.pdf> (last visited Mar. 10, 2020).

<sup>13</sup> HOUSE OF REPRESENTATIVES STANDING COMM. ON CLIMATE CHANGE, WATER, ENVIRONMENT AND THE ARTS, CANBERRA HOUSE OF REPRESENTATIVES, HOUSE OF REPRESENTATIVES COMMITTEE REPORT: MANAGING OUR COASTAL ZONE IN A CHANGING CLIMATE: THE TIME TO ACT IS NOW. CANBERRA: AUSTRALIAN GOVERNMENT (2009); Nicole Gurran et al., *Climate Change Adaptation in Coastal Australia: An Audit of Planning Practice*, 86 OCEAN & COASTAL MGMT. 100 (2013).

adaptation is a fraught legal and policy space.<sup>14</sup> Legacy development, competing public and private values, short- and long-term objectives, and uncertainty over the timing and magnitude of impacts give rise to conflicts in the design, implementation, and contestation of coastal adaptation planning laws and policies.<sup>15</sup>

This article examines the current state of coastal adaptation planning in Australia. It argues that there has been significant progress in precautionary planning and adaptive decision-making over the past decade. Although entrenched interests continue to favor coastal development and protection of vulnerable property, these special interests appear to be loosening their grip on coastal adaptation policy. Part II provides a brief overview of the emergence of coastal adaptation law in Australia, outlining the division of powers over coastal management across levels of government and the general features of current approaches. Part III then discusses the adaptation priorities reflected in current coastal management law and coastal planning policy, highlighting the emphasis on avoidance and retreat, and the strong policy preference against protection. Part IV reflects on barriers to future progress, noting the ongoing tensions between protecting public values and private property and the problems associated with devolving adaptation decision-making to local government. The Article concludes in Part V with consideration of the prospects for future development of coastal adaptation law in Australia.

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<sup>14</sup> Mark T. Gibbs, *Consistency in Coastal Climate Adaption Planning in Australia and the Importance of Understanding Local Political Barriers to Implementation*, 173 OCEAN & COASTAL MGMT. 131, 131 (2019); Mark T. Gibbs, Olivier Thebaud, & Donna Lorenz, *A Risk Model to Describe the Behaviours of Actors in the Houses Falling into the Sea Problem*, 80 OCEAN COASTAL MGMT. 73 (2013); Anna Hurlimann et al., *Urban Planning and Sustainable Adaptation to Sea-Level Rise*, LANDSCAPE & URBAN PLAN. 126, 84 (2014).

<sup>15</sup> Miguel F. Frohlich et al., *Towards Adaptive Coastal Management: Lessons from a “Legal Storm” in Byron Shire, Australia*, 179 OCEAN & COASTAL MGMT. 5 (2019); Ashley Robb et al., *Our Home is Girt by Seawalls? Preserving the Public Interest in an Era of sea level rise*, Env'tl. & Plan. L.J. 395–421 (2019); Justine Bell & Mark Baker-Jones, *Retreat from Retreat – The Backward Evolution of Sea-Level Rise Policy in Australia, and the Implications for Local Government*, 19 LOC. GOV'T L.J. 23 (2014).

## II. THE EVOLUTION OF ‘COASTAL ADAPTATION LAW’ IN AUSTRALIA

Coastal adaptation law is complex, dispersed, and continually evolving.<sup>16</sup> Australia’s coastal management framework consists of an overlapping and fragmented mix of national, state, and local government laws and policies, across intersecting policy domains. These include coastal management, land use planning, building standards, biodiversity conservation, fisheries, catchment management, and climate change.<sup>17</sup> The Commonwealth Constitution does not specifically grant the federal government law-making power over coasts, climate change, or the environment, although legislative authority could be derived from other Constitutional heads of power, particularly the external affairs power (giving effect to international environmental agreements), the trade and commerce, and corporations power.<sup>18</sup> Despite these sources of law-making power, and despite numerous national inquiries that have called for greater federal government involvement in coastal management, the federal government has limited its role to high-level policy coordination, some preliminary coastal hazard mapping, and funding.

Land use planning and coastal management are therefore state responsibilities.<sup>19</sup> Every state has its own planning regime, with overarching legislative objectives and processes and more detailed requirements specified in

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<sup>16</sup> Anita Foerster et al., *Transferable Lessons for Climate Change Adaptation Planning? Managing Bushfire and Coastal Climate Hazards in Australia*, 30 ENVTL. & PLAN. L.J. 469, 476 (2013) [hereinafter *Transferable Lessons for Climate Change Adaptation Planning*].

<sup>17</sup> See generally Barbara Norman & Nicole Gurrán, *Adapting to Long Term Coastal Climate Risk Through Planning Approaches and Instruments*, in COASTADAPT INFORMATION MANUAL 5 (3d. ed. 2018); ANDREW MACINTOSH, ANITA FOERSTER & JAN McDONALD, NAT’L CLIMATE CHANGE RESEARCH FACILITY, LIMP, LEAP OR LEARN? DEVELOPING LEGAL FRAMEWORKS FOR CLIMATE CHANGE ADAPTATION PLANNING IN AUSTRALIA 36–38 (2013), [hereinafter LIMP, LEAP OR LEARN]. For critiques of individual states, see Zada Lipman & Robert Stokes, *That Sinking Feeling: A Legal Assessment of the Coastal Planning System in New South Wales*, 28 ENVTL. & PLAN. L.J. 182 (2011); Robert Ghanem & Kirsty Ruddock, *Are New South Wales’ Planning Laws Climate-Change Ready?*, 28 ENVTL. PLAN. & L.J. 17 (2011); Robert Ghanem, Kirsty Ruddock & Josie Walker, *Are Our Laws Responding to the Challenges Posed to our Coasts by Climate Change?*, 31 U.N.S.W.L.J. 895 (2008); Justine Bell, *Planning for Climate Change and Sea Level Rise – Queensland’s New Coastal Plan*, 29 ENVTL. PLAN. & L.J. 61 (2012); Jonathan Verschuuren & Jan McDonald, *Towards a Legal Framework for Coastal Adaptation: Assessing the First Steps in Europe and Australia*, 1 TRANSNAT’L ENVTL. L. 355 (2012); John Watson, *Practical Precautions, Reasonable Responses: How South Australia’s Planning Regime Adapts to the Coastal Impacts of Climate Change*, 32 ENVTL. PLAN. & L.J. 256 (2015); Elisa de Wit & Rachael Webb, *Planning for Coastal Climate Change in Victoria*, 27 ENVTL. PLAN. & L.J. 23 (2010).

<sup>18</sup> GERRY BATES, ENVIRONMENTAL LAW IN AUSTRALIA (10th ed. 2019).

<sup>19</sup> LIMP, LEAP OR LEARN, *supra* note 17; Norman & Gurrán, *supra* note 17.

planning policies. Local or municipal governments—referred to as councils in Australia—are responsible for implementing state planning law and policy, through strategic planning documents and in the determination of development assessment decisions.<sup>20</sup> State governments across Australia have reformed coastal management and planning laws in a range of ways to respond to the prospect of heightened risks under climate change.<sup>21</sup> While there are no specific adaptation laws anywhere in the country,<sup>22</sup> the state of Victoria has adopted both general climate change legislation and specific coastal management reforms. The *Climate Change Act 2017* (Vic) requires the development of adaptation action plans relating to natural and social systems and the built environment.<sup>23</sup> The *Climate Change Act* also requires government decision-making across several other statutes, including in relation to coastal planning, to consider the impacts of climate change.<sup>24</sup> Generally, however, the principal mechanism for delivering climate change adaptation in Australia’s coastal communities is through land use planning, in conjunction with either specific coastal management planning policies or coastal management legislation.

Planning laws generally require local authorities to consider the impacts of coastal hazards on development, and to protect beach amenity and habitat protection.<sup>25</sup> State policies provide guidance to local authorities on how to account for erosion, shoreline recession, inundation, and storm surge in strategic plans. Some set specific requirements such as planning benchmarks or setback requirements for sea level rise.<sup>26</sup> This framework influences the nature and location of new development and thereby reduces exposure to coastal hazards, but the application of these measures is typically left to local planning authorities.

Specific coastal management legislation complements these planning arrangements in some jurisdictions, providing the criteria by which site-specific development proposals are assessed in the coastal zone and, sometimes,

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<sup>20</sup> *Id.*

<sup>21</sup> *Id.*

<sup>22</sup> Jan McDonald, *A Short History of Climate Adaptation Law in Australia*, 4 CLIMATE L. 150, 151 (2014).

<sup>23</sup> *Climate Change Act 2017* (Vict.) ss 34–40 (Austl.).

<sup>24</sup> *See id.* s 17, sch 1.

<sup>25</sup> The most recent and progressive regimes are in New South Wales, Victoria, and Western Australia. *Coastal Management Act 2016* (N.S.W.); *Marine and Coastal Act 2018* (Vict.); W. AUSTL. STATE PLANNING AUTH., W. AUSTL. STATE COASTAL PLANNING POLICY cl. 2.6. [hereinafter W. AUSTL. PLANNING POLICY].

<sup>26</sup> *Transferable Lessons for Climate Change Adaptation Planning*, *supra* note 16; Norman & Gurrin, *supra* note 19.

establishing independent specialist assessment panels. These laws require preparation of statewide coastal strategies and local and/or regional coastal management plans that prescribe management and adaptation priorities for each part of the coast, including areas mapped as hazard prone.<sup>27</sup> The Western Australian *State Coastal Policy*, for example, requires coastal managers and developers to undertake coastal adaptation planning, where existing or proposed development is at risk from coastal hazards over the timeframe of 100 years.<sup>28</sup>

The state government of Australia's most populous state, New South Wales, does not specify the timeframes over which decisions must consider climate change impacts. Instead, this is done at the level of each local government area, resulting in inconsistent coastal planning requirements along the coast. For example, the *Interim Coastal Hazard Adaptation Code* for the Shire of Eurobodalla, south of Sydney, sets different planning periods for considering the building life of a development: a maximum of fifty years for residential and commercial development (though commercial development may be assessed over a longer timeframe depending on its characteristics), and 80–100 years for major new infrastructure and land releases.<sup>29</sup> Using this approach, the Shire council may require larger setbacks, design modifications, or financial assurances for longer-life development.

With ultimate responsibility for coastal adaptation falling to local governments, most coastal local authorities in Australia have now considered and developed plans for coastal climate impacts in some form.<sup>30</sup> In some jurisdictions, plans have responded to current risks and dynamics. For most coastal councils, however, there is a genuine concern for both future-ready planning approaches and a desire to manage potential exposure to legal liability for approving new development in inappropriate locations. The sophistication of this local coastal adaptation planning has depended in large part on the size and resources of the

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<sup>27</sup> *Id.*; Philipa England, *Climate Change and Coastal Settlements: the Story so Far*, AUSTL. ENV'T R. 343 (Oct. 2012); Philipa England, *Too Much Too Soon? On the Rise and Fall of Australia's Coastal Climate Change Law*, 30 ENVTL. & PLAN. L.J. 390 (2013) [hereinafter *Too Much Too Soon*].

<sup>28</sup> W. AUSTL. PLANNING POLICY, *supra* note 25, at cl. 5.5.

<sup>29</sup> EUROBODALLA SHIRE COUNCIL, INTERIM COASTAL HAZARD ADAPTATION CODE (2015), [https://www.esc.nsw.gov.au/development-and-planning/tools/development-control-plans/Interim-Coastal-Hazard-Adaptation-Code\\_Amended-post-WRL-hazard-study.pdf](https://www.esc.nsw.gov.au/development-and-planning/tools/development-control-plans/Interim-Coastal-Hazard-Adaptation-Code_Amended-post-WRL-hazard-study.pdf) (last visited Mar. 10, 2020).

<sup>30</sup> Gurran et al., *supra* note 13; Michael Bradley et al., *The Pace and Progress of Adaptation: Marine Climate Change Preparedness in Australia's Coastal Communities*, 53 MARINE POL'Y 13 (2015).

local authority, and the level of political commitment to the problem. Further, strong adaptation plans are assisted by the clear articulation of adaptation priorities.

### III. ADAPTATION PRIORITIES IN COASTAL PLANNING

Coastal adaptation choices are shaped by physical climatic differences and a complex mix of political, cultural, social, and legal factors.<sup>31</sup> A range of adaptation options is recognized in both the academic and policy literature, typically, grouped based on their overall objective of avoidance, retreat, accommodation, or protection.<sup>32</sup> Until recently, the dominant approach along the developed parts of Australia's coastline has been to construct or install seawalls, groynes, or artificial reefs, alone or in conjunction with beach nourishment and restoration to protect infrastructure. This coastal armoring has exacerbated the impacts of development on coastal habitats.<sup>33</sup> Where protective structures are not accompanied by sand nourishment, they have also had significant adverse impacts on the beach and adjacent properties that do not have protection.<sup>34</sup>

The most recent wave of coastal management laws in Australia has done a far better job of requiring long-term adaptation planning for coastal climate hazards.<sup>35</sup> For example, the Western Australian *State Coastal Planning Policy* (SPP2.6) governs all future land use decisions affecting the coastal zone.<sup>36</sup> The objectives of the Policy include to:

- “ensure that development and the location of coastal facilities takes into account coastal processes, landform stability, coastal hazards, climate change and biophysical criteria;...
- “provide for public coastal foreshore reserves;” and

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<sup>31</sup> Xiangbai He, *Legal and Policy Pathways of Climate Change Adaptation: Comparative Analysis of the Adaptation Practices in the United States, Australia and China*, 7 *TRANSNAT'L ENVTL. L.* 347 (2018).

<sup>32</sup> Kelly L. Leo et al., *Coastal Habitat Squeeze: A Review of Adaptation Solutions for Saltmarsh, Mangrove and Beach Habitats*, 175 *OCEAN & COASTAL MGMT.* 180, 181–83 (2019).

<sup>33</sup> *Id.* at 181.

<sup>34</sup> Bruce Thom, *Geography, Planning and the Law: a Coastal Perspective*, 35 *AUSTRALIAN GEOGRAPHER* 3, 8 (2004).

<sup>35</sup> Jan McDonald, *Ebb and Flow of Coastal Adaptation in Australia*, in *CLIMATE CHANGE IMPACTS ON OCEAN AND COASTAL LAW: U.S. AND INTERNATIONAL PERSPECTIVES* 627 (Randall S. Abate ed., 2015).

<sup>36</sup> *W. AUSTL. PLANNING POLICY*, *supra* note 25, at cl. 2.3, 5.5.

- “protect, conserve and enhance coastal values.”<sup>37</sup>

The *Coastal Policy* requires unacceptable levels of risk to be reduced to acceptable levels, based on an adaptation planning hierarchy that prioritizes avoiding the presence of new development in vulnerable areas and retreating from, or relocating assets in, areas subject to an intolerable risk of damage. Accommodation—through design or management strategies—is a third-best option where there is sufficient justification for not avoiding development and protection is considered a last resort, as well as where there is a need to preserve the foreshore reserve, public access, and public safety.<sup>38</sup> Local authorities are required to prepare Coastal Hazard Risk Management and Adaptation Plans (CHRMAP) using guidelines prepared by the Western Australian Planning Commission, then amend their planning schemes in line with those CHRMAPs.<sup>39</sup> For example, the Shire of Dandaragan recently included a special control area in its planning scheme that contemplates the need for future retreat. It provides that all proposed development within the control area requires approval, and that approval will only be issued on a temporary or time-limited basis.<sup>40</sup>

The new coastal management framework in New South Wales clarifies that coastal environmental values should be prioritised above other values. The 2018 New South Wales *Coastal Management State Environmental Planning Policy* provides that the development controls of the four coastal management areas prevail in the following order:

- 1) the coastal wetlands and littoral rainforests area;
- 2) the coastal vulnerability area;
- 3) the coastal environment area; and
- 4) the coastal use area.<sup>41</sup>

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<sup>37</sup> *Id.* at cl 4.

<sup>38</sup> W. AUSTL. PLANNING POLICY, *supra* note 25, at cl. 5.5(iii).

<sup>39</sup> W. AUSTL. PLANNING COMM’N, COASTAL HAZARD RISK MANAGEMENT AND ADAPTATION PLANNING GUIDELINES (2019) [hereinafter WAPC, CHRMAP Guidelines], [https://www.dplh.wa.gov.au/getmedia/76fb800f-07ad-479a-8efc-50dc2d812448/GD\\_CST\\_coastal\\_hazard\\_risk\\_management](https://www.dplh.wa.gov.au/getmedia/76fb800f-07ad-479a-8efc-50dc2d812448/GD_CST_coastal_hazard_risk_management) (last visited Mar. 10, 2019).

<sup>40</sup> Personal Communication with Ashley Robb on October 21, 2019.

<sup>41</sup> N.S.W. COASTAL MANAGEMENT STATE ENVIRONMENTAL PLANNING POLICY cl. 18 (2018) [hereinafter N.S.W. PLANNING POLICY].



The *Policy* is still too new to know how it will be implemented. If the hierarchy is applied in the manner specified, it suggests a clearer prioritization of public values in future coastal management planning than has historically occurred.<sup>42</sup>

Victoria's coastal adaptation priorities must be gleaned from a range of statutes and policy documents. The 2018 Victorian *Marine and Coastal Act* sets out key objectives for the planning and management of the marine and coastal environment in that state, but the clear priority is for adaptation to coastal climate hazards that protects beach amenity. The first three statutory objectives, in order, are:

- 1) protection and enhancement of the coastal and marine environment;
- 2) promoting resilience to climate change; and
- 3) respecting natural processes in planning for and managing current and future risks from coastal hazards and climate change.<sup>43</sup>

In comparison, the highest priority of the 2014 *Victorian Coastal Strategy* is to ensure the protection of significant environmental and cultural coastal values.<sup>44</sup> It then emphasizes the need for integrated planning for future management, and the importance of public benefit in the use of scarce public coastal resources.<sup>45</sup> Finally, the State's *Climate Change Adaptation Plan* for 2017–2020 identifies principles to guide the government's approach to adaptation. These include:

- the importance of flexible and iterative approaches and the need to preserve future options;
- consideration of long-term costs and externalities of climate impacts;
- the need for inter- and intra-generational fairness, recognition of inevitable trade-offs and limits to adaptation; and
- the allocation of responsibility for risks on those best-placed to manage them.<sup>46</sup>

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<sup>42</sup> Frohlich et al., *supra* note 15.

<sup>43</sup> *Marine and Coastal Act 2018* (Vict.) s 7 (Austl.).

<sup>44</sup> VICTORIAN COASTAL STRATEGY 2014, *supra* note 4, at 29.

<sup>45</sup> *Id.*

<sup>46</sup> STATE OF VICTORIA DEP'T OF ENV'T, LAND, WATER AND PLANNING, VICTORIA'S CLIMATE CHANGE ADAPTATION PLAN 2017–2020 17 (2016),

## A. Implementation of Adaptation Priorities in Local Plans

Implementation of over-arching adaptation priorities has so far occurred primarily through state planning policies or local adaptation plans. The coastal adaptation plans and strategies developed to date have followed a broadly similar process that is underpinned by a risk management framework. First, a coastal hazard (inundation or erosion) risk assessment is conducted to identify risks and understand the impacts of coastal hazards using downscaled climate modelling, and mapping of heights using LIDAR or other technology and shoreline composition (sandy beach, rocky cliffs, estuary, etc.). In Queensland and Victoria, the state governments have undertaken this mapping. The results of this vulnerability assessment form the basis for a voluntary and generally self-selecting community consultation process in which hazards and potential adaptation options to avoid or manage risks are identified and discussed.<sup>47</sup> The costs and benefits of each strategy are then evaluated before developing a final plan.<sup>48</sup> This body of adaptation planning, strategizing, and research in both academic and grey literature has produced a wealth of knowledge and insights about models of collaborative governance for coastal adaptation, and lessons for the future. But despite a broadly consistent method being adopted, these coastal adaptation plans and strategies have resulted in very different recommendations. Some plans recommend retreat, others accommodation, others still various forms of protection or defense.<sup>49</sup> To date, the most consistent feature across the country has been the preference for protective works in areas of intensive (high-value) urban development and infrastructure, highlighting the limits of avoidance as an adaptation strategy.<sup>50</sup>

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[https://www.climatechange.vic.gov.au/data/assets/pdf\\_file/0024/60729/Victorias-Climate-Change-Adaptation-Plan-2017-2020.pdf](https://www.climatechange.vic.gov.au/data/assets/pdf_file/0024/60729/Victorias-Climate-Change-Adaptation-Plan-2017-2020.pdf) (last visited Mar. 10, 2020).

<sup>47</sup> Gibbs, *supra* note 14, at 132; WAPC, CHRMAP Guidelines, *supra* note 39, at 9. *See also*, AUSTRALIAN STANDARD RISK MANAGEMENT - GUIDELINES (2018), AUSTRALIAN STANDARD CLIMATE CHANGE ADAPTATION FOR SETTLEMENT AND INFRASTRUCTURE - A RISK BASED APPROACH (2013), CLIMATE CHANGE IMPACTS AND RISK MANAGEMENT: A GUIDE FOR BUSINESS AND GOVERNMENT (2007), AUSTRALIAN STANDARD ENVIRONMENTAL RISK MANAGEMENT - PRINCIPLES AND PROCESSES (2006), AND CLIMATE CHANGE RISK AND VULNERABILITY: PROMOTING AN EFFICIENT ADAPTATION RESPONSE IN AUSTRALIA, REPORT TO THE AUSTRALIAN GREENHOUSE OFFICE (2005).

<sup>48</sup> WAPC, CHRMAP Guidelines, *supra* note 39, at 9.

<sup>49</sup> Gibbs, *supra* note 14, at 133.

<sup>50</sup> *Id.*

## B. The Limits of Avoidance as a Coastal Adaptation Priority

In many places, the opportunity to avoid exposure to coastal climate hazards altogether is well and truly passed with the granting of freehold title over foreshore land and extensive coastal development.<sup>51</sup> In highly-developed parts of coastal Australia, however, there is an expectation that local planning authorities should at least avoid *new or intensified* development in areas exposed to climate risks.<sup>52</sup> The expectation to minimize further exposure by avoiding new development applies at both the strategic and project approval levels. The typical approach to strategic land use requires development approval for new development within mapped areas, including intensification of existing land use. Development approval depends upon the consistency of the proposal with hazard projections over the planning timeframe for particular development times (large infrastructure having the longest planning timeframe). The Western Australian *State Coastal Policy*, for example, requires coastal managers and developers to impose restrictions where existing or proposed development is at risk over the timeframe of 100 years.<sup>53</sup> Specifically, development must be set back from the coastal foreshore if it will be vulnerable to coastal processes over the next 100 years, *or* to maintain conservation of the values, functions, and uses of the current reserve. These kinds of setback requirements are set out in Victorian, South Australian and Queensland state planning policies, and the coastal adaptation plans for some, but not all, local government areas in New South Wales.<sup>54</sup>

Several planning cases have applied the precautionary principle to avoid further exposure by restricting new development, focusing on how new development may expose future communities financially and legally or deprive those future communities of access to the coastal foreshore. For example, in a case involving coastal land in the Gippsland Lakes region of Victoria's southern coastline, the Victorian Civil and Administrative Tribunal drew on the precautionary principle and intergenerational equity to refuse new development, saying:

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<sup>51</sup> In many places where the property boundaries are fixed by survey, known as a 'right line' boundary, public foreshore reserves have been eroded and the fixed boundary of private land is now on the beach or even in the water. Thom, *supra* note 34, at 10. Thom notes that approximately 50,000 N.S.W. properties are bounded by the mean high water mark, but because title was registered in periods of beach accretion, foreshore landowners have defended boundaries with walls.

<sup>52</sup> In N.S.W., no development may be approved for the coastal zone if it might increase coastal hazards. See N.S.W. PLANNING POLICY, *supra* note 41, at cl. 15.

<sup>53</sup> W. AUSTL. PLANNING POLICY, *supra* note 25, at cl. 5.5.

<sup>54</sup> Norman & Gurrin, *supra* note 19; LIMP, LEAP OR LEARN, *supra* note 17.

. . . It is no longer sufficient to rely only on what has gone before, to assess what may happen again . . . rising sea levels are to be expected. The range of impacts may well be beyond the predictive capability of current assessment techniques. In the face of such evidence, a course of action is warranted to prevent irreversible or severe harm . . . There is a longer-term risk of intergenerational liability that should be avoided.<sup>55</sup>

A recent decision in Western Australia shows that this trend is occurring more widely but is especially apparent where the policy framework is clear about how climate risks are to be considered. In the first test of Western Australia's new *State Coastal Policy*, discussed above, the Western Australian State Administrative Tribunal (WASAT) (which determines merits appeals from municipal planning decisions and the state planning commission, the WAPC) rejected a proposal for new development on the basis that it did not meet the setback requirements stipulated in the state's coastal planning framework. The WAPC rejected a localized strategic plan, known as a local structure plan, for a coastal area north of Perth, which would have guided a new subdivision of land along a 2.6 kilometer stretch of coastline.<sup>56</sup> A coastal foreshore reserve had already been ceded to the Crown as a condition of an earlier subdivision approval in 1997, but expert evidence pointed to the prospect of shoreline recession of 145–171 meters over the 100-year period. This meant that the entire current coastal foreshore reserve would be lost to recession, and that a much larger portion of the land was therefore required to be protected against further development.

The WASAT held that the developer was required to cede land to the State to maintain the foreshore, without payment of compensation, even though it acknowledged this would have a significant economic impact. It held that preserving this future foreshore reserve would benefit incoming residents and ecological values alike.<sup>57</sup> According to the WASAT:

Even though the initial incoming population on the land, and the population over the next half-century or longer, will have access to all or at least some of the currently existing coastal foreshore

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<sup>55</sup> *Gippsland Coastal Board v South Gippsland Shire Council (Vic)* (Austl.).

<sup>56</sup> *Two Rocks Investments Pty Ltd and Western Australian Planning Commission (WA)* [2019] WASAT 59 (Austl.).

<sup>57</sup> *Id.* at 6.

reserve, ultimately the community on the land, which is facilitated by the granting of subdivision or development approval now, will require the coastal foreshore reserve, which is not vulnerable to coastal processes at the end of the 100-year planning timeframe in the year 2120, for its use and enjoyment as the coastal foreshore.<sup>58</sup>

The WASAT did not refuse development of the entire region, however. Consistent with a policy purpose of “encourag[ing] innovative approaches to management coastal hazard risk,”<sup>59</sup> the WASAT did approve interim retention and development of two areas in the short term, as “coastal nodes.” While it could be developed in the short-to-medium term, this land was required to be vested to the Crown when it became vulnerable, which the SAT determined to be when the ‘horizontal shoreline datum’ reached forty meters from the land.

As these cases show, an avoidance strategy has been easier to achieve in planning cases involving ‘greenfields’ sites, where there is not yet any investment in infrastructure. In these locations, avoiding exposure by simply refusing building in such areas is still an economically feasible (and politically acceptable) option. Where development authorities must consider applications to protect, develop, or redevelop land in already built-up areas, however, the case for avoidance is weaker and far more politically fraught.

In *Newton v. Great Lakes Council*, for example, the New South Wales Land and Environment Court upheld an appeal challenging the decision of Great Lakes Council to impose a twenty-year time restriction on a development approval for a house in one of the state’s top coastal erosion hotspots.<sup>60</sup> The Great Lakes Council had modelled the erosion line over various timeframes, and the 2033 erosion line cut across the site. Accordingly, it granted approval for only twenty years—a time in the future when these effects may be expected to have materialized. The court considered it unreasonable to impose a time limit on this development, when no other property was subject to the same provision, especially given that the purchasers of the land had been given no forewarning of this type of control in the pre-purchase planning certificate issued by council, and because the council had also required construction standards aimed at ensuring the building’s integrity in light of the erosion threat. Perhaps unsurprisingly, since the time of this decision, at least two severe storms have caused extreme erosion

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<sup>58</sup> *Id.* at 7.

<sup>59</sup> W. AUSTL. PLANNING POLICY, *supra* note 25, at cl. 2.4-2.6.

<sup>60</sup> *Newton and Another v Great Lakes Shire Council (NSW)* [2013] NSWLEC 1248 (Austl.).

along the beach in the area, including partial loss of the main access road. The State and local governments have been required to fund the installation of an AU\$3.7million sand pumping facility, in order to sustain sand nourishment over periods of intense erosion.<sup>61</sup>

### C. Limiting Coastal Protection

In addition to soft protection works such as sand nourishment, Australia has a long history of using coastal protection structures like seawalls and rock groynes.<sup>62</sup> While such structures have enabled coastal development to proceed and enabled governments to avoid difficult decisions about retreat and relocation, these hard structures have significant and well-documented drawbacks. In particular, seawalls have adverse impacts on the beach and on neighboring properties.<sup>63</sup> Their effectiveness will also reduce in the future, as sea levels exceed design levels, thus exposing the managers of such structures to upgrade, repair, or compensate landowners for the impacts of failure.<sup>64</sup> Restricting and, potentially, removing such coastal defenses may therefore be necessary to protect beach amenity and coastal environmental values and, in some cases, private property.

As discussed in Part II:A above, coastal protection is ranked lowest in the hierarchy of preferred strategies in most Australian states.<sup>65</sup> State governments and local councils in Australia have adopted several strategies aimed at limiting further shoreline protection. These include removing or declining to maintain structures on public land and prohibiting or restricting the construction of coastal protection works on private land.<sup>66</sup>

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<sup>61</sup> *Sand Will be Transferred from Winda Woppa to Jimmys Beach*, MANNING TIMES, Mar. 16, 2019, <https://www.manningrivertimes.com.au/story/5950260/jimmys-beach-sand-transfer-system-is-on-schedule/> (last visited Mar. 10, 2020).

<sup>62</sup> Ben Harman et al., *Global lessons for Adapting Coastal Communities to Protect Against Storm Surge Inundation*, 31 J. OF COASTAL RES. 790, 798 (2015); Robb et al., *supra* note 15.

<sup>63</sup> Karl F. Nordstrom, *Living with Shore Protection Structures: A Review*, 150 ESTUARINE, COASTAL & SHELF SCIENCE 11 (2014); John N. Kittinger & Adam L. Ayers, *Shoreline Armoring, Risk Management and Coastal Resilience Under Rising Seas*, 38 COASTAL MGMT. 634 (2010); ORRIN PILKEY & JAG COOPER, *THE LAST BEACH* (Duke University Press, 2014).

<sup>64</sup> K. Coleman, *Coastal Protection and Climate Change*, 84 AUSTRALIAN L.J. 421 (2010). *But see* John Corkill, *Claimed Property Right Does Not Hold Water*, 87 AUSTRALIAN L.J. 49–58 (2013).

<sup>65</sup> *E.g.*, *Coastal Planning Policy* (W. Austl.) cl. 2.6 (Austl.) (2013); GOV'T OF WESTERN AUSTR., *WA COASTAL ZONE STRATEGY* (2017); Robb et al., *supra* note 15, at 398.

<sup>66</sup> Ashley Robb et al., *Development Control and Vulnerable Coastal Lands: Examples of Australian Practice*, URB. POL'Y & RES. (2018); Robb et al., *supra* note 15, at 398.

Before examining the effectiveness of such restrictions, it should first be noted that there has been debate in Australia over whether property owners have a common law right to protect their properties from the action of the sea, and whether coastal managers are under a common law legal duty to protect coastal land from actions of the sea.<sup>67</sup> Whether landowners have the right to protect property has not been judicially considered, but there is at least some support for recognition of a common law right to protect private property from actions of the sea in certain circumstances.<sup>68</sup>

Whether there is any corresponding public duty to protect private property is another matter. Writing in the *Australian Law Journal*, the lawyer representing the group of wealthy coastal landowners at Belongil Beach on the New South Wales north-coast (Australia's most litigated, high-value erosion hotspot<sup>69</sup>) argued that coastal managers should have such a duty. She claimed it was part of the British common law which Australia inherited, aligns with the public interest, and has not been abrogated by statute.<sup>70</sup>

The case for a duty to protect coastal foreshore is stronger where coastal managers have taken actions that exacerbate the actions of the sea. For example, the litigants in the Belongil litigation have consistently argued that construction of a sea wall to protect the business center up-drift of their properties worsened erosion because it starved the beach of sand.<sup>71</sup> These questions still await judicial determination in Australia because the Byron Shire Council reached an out of court settlement with all litigants to the Belongil dispute while it was still before the New South Wales Supreme Court, at the urging of their insurers.<sup>72</sup>

Whether or not such right to protect land ever existed, they are modified by statutory restrictions in many Australian coastal jurisdictions. In Western Australia, new coastal protection projects are only permitted:

- after all other options for avoiding and adapting to coastal hazards have been fully explored;
- where they are primarily proposed in the public interest;
- where there will be no off-site impacts; and

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<sup>67</sup> John Corkill, *Principles and Problems of Shoreline law*, NOG, NCCARF (2012).

<sup>68</sup> Coleman, *supra* note 62. *But see* Corkill, *supra* note 62, at 49–58.

<sup>69</sup> Frohlich et al., *supra* note 15, at 5–6.

<sup>70</sup> Coleman, *supra* note 62.

<sup>71</sup> Robb et al., *supra* note 15, at 400.

<sup>72</sup> *Id.*

- where funding for construction and maintenance is provided from the outset.<sup>73</sup>

This principle also applies to the repair and upgrade of existing projects.<sup>74</sup> The position is similar, but slightly weaker, elsewhere. In Queensland, a new coastal protection project must be a last resort when:

- erosion poses an imminent threat to public safety or existing structures;
- the property cannot reasonably be relocated or abandoned;
- the proposed project ensures that private property is located as far landwards as practicable; and
- any increase in risks for adjacent areas is mitigated.<sup>75</sup>

Restrictions on coastal protection in the 2016 New South Wales *Coastal Management Act* have limited the options available to coastal managers in the Belongil Beach erosion hotspot. The Act prohibits the approval of coastal protection works unless the proponents can show that they will not unreasonably limit public access to, or use of, a beach or headland, or pose a threat to public safety.<sup>76</sup> Property owners are also required to bear the costs of maintenance or land restoration works that might be required, with the funding of such works either through financial assurance or bond, or by payment of an annual charge for coastal protection services.<sup>77</sup>

These requirements have been hard to satisfy—politically if not legally. In 2016, the Byron Shire Council prepared a draft Coastal Zone Management Plan (CZMP) that proposed construction of an “adaptive ‘seawall with walkway’” to

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<sup>73</sup> W. AUSTRAL. PLANNING POLICY, *supra* note 25, at s 5.7(i); GOV'T OF WESTERN AUSTRAL., COASTAL ZONE STRATEGY 7 (2017).

<sup>74</sup> W. AUSTRAL. PLANNING POLICY, *supra* note 25, at s 5.7(ii).

<sup>75</sup> QUEENSL. DEP'T OF ENV'T & HERITAGE, COASTAL MANAGEMENT PLAN 7 (cl. 1.7) (2013), [https://www.qld.gov.au/data/assets/pdf\\_file/0029/67961/coastal-management-plan.pdf](https://www.qld.gov.au/data/assets/pdf_file/0029/67961/coastal-management-plan.pdf) (last visited Mar. 10, 2019); QUEENSL. DEP'T OF STATE DEV., INFRASTRUCTURE AND PLANNING., STATE PLANNING POLICY 51 (2013).

<sup>76</sup> QUEENSL. DEP'T OF STATE DEV., INFRASTRUCTURE AND PLANNING., STATE PLANNING POLICY s 27.

<sup>77</sup> S 27(2) cl. 12 of the 2018 Coastal Policy provides further that development on land within the coastal vulnerability areas may only proceed if structures are engineered to withstand current and projected coastal hazards, are not likely to adversely alter coastal processes or reduce public amenity and access, and manage risk to life and public safety. It also requires measures to ensure appropriate responses to, and management of, anticipated coastal processes and current and future coastal hazards.



resolve the erosion problems at Belongil Beach.<sup>78</sup> The prospects of sourcing the required sand to conduct sand nourishment if the seawall led to erosion were poor, so the proposal was fundamentally flawed. On this basis, the proposal did not meet the statutory requirements that arrangement be in place upfront to manage impacts or assure the removal of the seawall if it interfered with coastal processes.<sup>79</sup> The New South Wales Coastal Panel advised the Minister for Environment that the Draft CZMP did not meet the requirements to receive certification under the 2016 *Coastal Management Act*, and the council withdrew the draft in 2017.

Litigation over the right of owners to repair protective structures has further confused the issue. After years of litigation, the local government agreed to an out-of-court settlement for several landowners to discontinue their Supreme Court action to clarify the scope of the Byron Shire Council's duty of care. In addition to an AU\$2.75 million monetary payment to property owners, the settlement prevented the Byron Shire Council from removing any current protection from in front of the properties, or removing lawfully-approved repairs where applications for approval were made within twelve months of the order.<sup>80</sup> This has constrained the Byron Shire Council's capacity to develop better long-term options.

In a further twist, the New South Wales Land and Environment Court has recently ruled that attempts by beachfront owners to repair the sea walls in front of their homes are unlawful. In *Ralph Lauren Property Ltd v Transitional Coastal Panel* and related cases,<sup>81</sup> the owners of three Belongil Beach properties appealed against the refusal of the New South Wales Transitional Coastal Panel—the specialist body empowered to assess applications for coastal development—of

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<sup>78</sup> BYRON SHIRE COUNCIL, COASTAL ZONE MANAGEMENT PLAN Part A-x (2016, draft).

<sup>79</sup> Frohlich et al., *supra* note 15, at 8.

<sup>80</sup> *Id.* (citing the Extraordinary Meeting Minutes of the Byron Shire Council's meeting held on July 14, 2016, available at [https://byron.infocouncil.biz/Open/2016/07/OC\\_14072016\\_MIN\\_585\\_EXTRA.PDF](https://byron.infocouncil.biz/Open/2016/07/OC_14072016_MIN_585_EXTRA.PDF) (last visited Mar. 10, 2020)). Frohlich reports that the decision to settle was heavily influenced by the council's insurer and their concerns over financial exposure if the litigation found the council liable for reduced property values as a result of the early Jonson Street projects: "The insurers were simply interested in getting out of the situation as cheaply as possible . . . So, when they were offered a settlement, . . . they weren't interested in who was right or wrong" Interviewee quoted in Frohlich et al., *supra* note 15, at 8.

<sup>81</sup> *Ralph Lauren Property Ltd v New South Wales Transitional Coastal Panel* (Austl.); *Stewartville Pty Ltd v New South Wales Transitional Coastal Panel* (Austl.); *Robert Watson v New South Wales Transitional Coastal Panel* [2018] NSWLEC 207 (Austl.).

their applications to repair and upgrade rock and concrete rubble sea walls on the public beach seaward of their properties. The residents had argued that the project would protect public property and improve public safety and access to the beach. They also argued that, as they proposed only to repair existing seawalls, they could not cause any additional damage to the beach. The Transitional Coastal Panel<sup>82</sup> argued that permitting repair:

would formalise uncoordinated and piecemeal responses to coastal erosion processes operating at Belongil Beach, regularise unlawful works located largely on public land for the protection of private property, and confer a valuable private benefit at the expense of the public.<sup>83</sup>

The New South Wales Land and Environment Court upheld these concerns, finding that the size and extent of the works would result in them significantly impeding public access.<sup>84</sup> Chief Judge Preston rejected arguments that the repair would not materially increase the impacts caused by the existing walls because “by law, the sea walls should not exist on the beach” at all.<sup>85</sup> No development consent had ever been issued for construction of the sea walls that were in place and, while this did not preclude approval being granted for the repair projects, nor did it allow applicants to benefit from earlier unlawful projects.<sup>86</sup> Despite this decision, but consistent with the earlier out-of-court settlement, Byron Shire Council consented to minor repairs to the seawalls conditional upon the landowners agreeing to remove structures once the state government approves a proposal to protect the entire beach and provide equivalent levels of protection.<sup>87</sup>

In theory, limiting protective structures enables a form of staged retreat that allows market forces to adjust the valuation of coastal properties to reflect risk over time and does not require planning agencies to pay compensation for forced removal of structures. However, there are numerous other examples of sea

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<sup>82</sup> This is the temporary body established under the transitional arrangements of the N.S.W. 2016 Coastal Management Act, prior to the establishment of the N.S.W. Coastal Council.

<sup>83</sup> *Ralph Lauren Pty Ltd v New South Wales Transitional Coastal Panel* (Austl.); *Stewartville Pty Ltd v New South Wales Transitional Coastal Panel* (Austl.); *Robert Watson v New South Wales Transitional Coastal Panel* [2018] NSWLEC 207, ¶7 (Austl.).

<sup>84</sup> *Robert Watson*, NSWLEC 207, at ¶122.

<sup>85</sup> *Id.* at ¶127.

<sup>86</sup> *Id.*

<sup>87</sup> Frohlich et al., *supra* note 15, at 10.

walls and other hard structures being approved and built, underscoring the gap between legislative and policy constraints and the political dimensions of coastal planning.<sup>88</sup> In practice, the decision to allow protective structures is influenced by several factors, including the technical capacity of the decision-maker to evaluate risks and wider public benefits (discussed above), and legal powers to enforce obligations to fund and maintain such structures.<sup>89</sup> What is clear is that, despite the policy statements to the contrary, “landholders have an expectation to protect property and have demonstrated a willingness to: act politically; take action through courts; and build protections illegally.”<sup>90</sup>

#### IV. ALLOCATION OF RISK IN COASTAL ADAPTATION

There has been considerable policy rhetoric about the appropriate roles of public and private actors in adaptation planning. Australian policy documents make clear that private parties are responsible for adaptation and managing risks to private property wherever feasible.<sup>91</sup> Both the Victorian and the Western Australian framework offer detailed guidance on how risks should be allocated. The 2017 Western Australian *Coastal Zone Strategy* makes clear that private parties are responsible for managing risks to private property, while government bears responsibility for managing risk to public goods and assets and developing local policies and regulations.<sup>92</sup> Providing information to current owners and prospective purchasers of hazard-prone land is a key mechanism by which government may discharge its responsibility to enable private adaptation through appropriate information.<sup>93</sup>

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<sup>88</sup> This pattern is consistent with the experience of strict prohibitions and restrictions in the United States. William Neal, *Why Coastal Regulations Fail*, 156 OCEAN & COASTAL MGMT. 21 (2018).

<sup>89</sup> For example, the availability of agreements on title or covenants, public liability waivers, and financial securities. LIMP, LEAP OR LEARN, *supra* note 17, at 56; Robb et al., *supra* note 62, at 404.

<sup>90</sup> Robb et al., *supra* note 62, at 404–405 (footnotes omitted).

<sup>91</sup> AUSTL. DEP’T OF THE ENV’T, CLIMATE CHANGE COMMUNITY DISCUSSION: ROLES AND RESPONSIBILITIES FOR CLIMATE CHANGE ADAPTATION IN AUSTRALIA [hereinafter CLIMATE CHANGE COMMUNITY DISCUSSION]; AUSTL. PRODUCTIVITY COMM., BARRIERS TO EFFECTIVE CLIMATE CHANGE ADAPTATION (2012), <https://www.pc.gov.au/inquiries/completed/climate-change-adaptation/report/climate-change-adaptation.pdf> (last visited Mar. 10, 2020). Both the Victorian and the Western Australian frameworks offer detailed guidance on how risks should be allocated.

<sup>92</sup> GOV’T OF WESTERN AUSTL., WA COASTAL ZONE STRATEGY (2017), [https://www.dplh.wa.gov.au/getmedia/a608b7f4-85c6-414e-b370-c3c2c0c28102/CST-WA\\_Coastal\\_Zone\\_Strategy](https://www.dplh.wa.gov.au/getmedia/a608b7f4-85c6-414e-b370-c3c2c0c28102/CST-WA_Coastal_Zone_Strategy) (last visited Mar. 10, 2020).

<sup>93</sup> VICT. STATE GOV’T, VICTORIA’S CLIMATE CHANGE ADAPTATION PLAN 2017-2020 27 (2016) (stating that “Most importantly, we need to ensure that government, community and industry can easily access, understand and apply current and emerging information” and “Risk assessments

Accurate coastal hazard information enables property owners to prepare and plan for future impacts. But it can also influence expectations of what level of public support or action should be expected in the future. Some jurisdictions may provide online maps showing the future hazard line projections which a prospective purchaser can access and evaluate. These maps are sometimes offered in conjunction with zoning schedules that outline what restrictions may apply to certain mapped hazard lines. This approach requires that interested parties are both aware of these maps and have the capacity to interpret and interrogate them.

More helpful is the provision of property-specific information—provided by vendors to prospective purchasers as a standard part of risk disclosure upon sale. For example, Western Australia’s *State Coastal Policy* requires that identified coastal hazards should be disclosed to people likely to be affected.<sup>94</sup> The method for doing this for existing development is not specified, but for sites that are the subject of subdivision or development applications, the following notation is required on the certificate of title:

VULNERABLE COASTAL AREA – This lot is located in a [*sic – an*] area likely to be subject to coastal erosion and/or inundation over the next 100 years.<sup>95</sup>

This notation is framed broadly and does not distinguish between present and future hazards. It also does not provide any indication of how planning controls will affect the site, so its generality may be problematic for guiding decision-making.

New South Wales requires vendors to provide purchasers of prescribed information about restrictions on properties. A “Section 149(2) Certificate” details restrictions on development or use of the land, and is a mandatory accompaniment to contracts for the sale of land. This certificate must include the fact that land is located in the coastal zone as mapped under the 2018 *Coastal Management State Environmental Planning Policy*.<sup>96</sup>

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help state and local governments and the wider community to understand the exposure of particular areas or assets to the impacts of climate change.”).

<sup>94</sup> W. AUSTL. PLANNING POLICY, *supra* note 25, at cl. 1(1) and 7.

<sup>95</sup> *Id.* at cl. 5.5(ii)

<sup>96</sup> N.S.W. DEP’T OF ENV’T & PLANNING, PLANNING CIRCULAR: NOTATIONS ON SECTION 149 PLANNING CERTIFICATES FOR LAND AFFECTED BY THE DRAFT COASTAL MANAGEMENT SEPP (2016), <https://www.planning.nsw.gov.au/-/media/Files/DPE/Circulars/planning-circular->

While mapping and hazard notices may be a useful tool, there are still years of value in most beachfront properties before coastal climate change impacts render them dangerous or unusable. The market has shown no signs of adjusting property prices to reflect their vulnerability to coastal hazards, even where extreme events actually occur and the property is damaged. But warnings about future hazards can at least start to send signals about how an area might be expected to look by 2050 or 2100, especially if done in conjunction with restrictions on the installation or repair of hard protection structures. It is important that information to prospective purchasers should be consistent in both format and the timing of when it is required, so as to avoid market distortions that unfairly disadvantage owners in local government jurisdictions with tighter information policies.<sup>97</sup> This is particularly true between areas attracting similar pools of prospective purchasers. As noted in the discussion of planning benchmarks, not all local governments have undertaken extensive detailed hazard mapping to provide such information to property owners or the public. The absence of information on title or in a planning certificate may convey a false sense of safety about one site, while the provision of information about other sites may unfairly suggest that they are comparatively riskier.

The provision of coastal hazard information as a statewide policy seems generally to be met with little hostility, but coastal hazard notices advised by individual councils have been strongly resisted by landowners.<sup>98</sup> For example, in 2009, the New South Wales municipality of Gosford added the following statements to pre-purchase (s149(5)) certificates for 9000 properties:

“this land has been identified as being potentially affected by sea level rise of up to 0.9m by the year 2100.”<sup>99</sup>

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[notations-on-section-149-planning-certificates-for-land-affected-by-the-draft-coastal-management-sepp-2016-07.pdf?la=en](https://www.austlii.edu.au/au/other/dfat/special/sea-level-rise/2016-07.pdf?la=en) (last visited Mar. 10, 2020).

<sup>97</sup> A proposal to include climate change hazard information on land titles in Victoria was rejected because of risk of inconsistent notices, and problems in obtaining finance and insurance for properties subject to such notations.

<sup>98</sup> Paul Govind, *Managing the Relationship between Adaptation and Coastal Land Use Development through the Use of s 149 Certificates*, 7 MACQUARIE J. INT’L COMP. ENVTL. L. 94 (2011), available at <http://classic.austlii.edu.au/au/journals/MqJICEnvLaw/2011/5.pdf> (last visited Mar. 10, 2020).

<sup>99</sup> See Vikki Champion, *Sea Level Rise Planning Clause Dumped*, THE DAILY TELEGRAPH, July 4, 2012, <https://www.dailytelegraph.com.au/sea-level-rise-planning-clause-dumped/news-story/5c6c032ca67d467bd9f02826195c7a4e?sv=b7e98011578063409dd09c65fbaf2cac> (last visited Mar. 10, 2020).

Other councils inserted similar warnings, aiming to limit their exposure to future liability to purchasers who might claim that the council knew about the coastal hazard problem, but did not act to warn people.<sup>100</sup> Despite there being no evidence of a lasting impact on property values for either the notice or the occurrence of extreme events,<sup>101</sup> the New South Wales state government determined that such general statements are not acceptable subjects of a Section 149 Certificate. The Act permits Councils to include “general information about past, current, or future matters that may potentially affect the land,” but generalized statements about potential future exposure are not considered appropriate.<sup>102</sup> To be acceptable the hazard information must be converted into enforceable planning restrictions.<sup>103</sup>

What emerges from this brief review of Australia coastal adaptation law is a picture of strong policy commitment to protecting the environmental and cultural values of the beach and coast, with clear prioritization of avoidance and retreat from hazardous locations. In practice, however, the heavy investment in coastal property and infrastructure means that the gap between policy and practice persists.

## V. BARRIERS TO ADAPTIVE COASTAL LAW IN AUSTRALIA

Recent improvements in the legal and policy framework for adaptive coastal planning and management are welcome, but their effectiveness is constrained by several key barriers that have plagued this policy domain for over three decades.<sup>104</sup> These barriers are interrelated and either contribute to, or

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<sup>100</sup> Govind, *supra* note 102, at 96; *Too Much Too Soon*, *supra* note 27, at 394–97.

<sup>101</sup> Stephen Yeo, *Effects of Disclosure of Flood- Liability on Residential Property Values*, 16 AUSTL. J. OF EMERGENCY MGMT. 35, 40 (2003).

<sup>102</sup> McDonald, *supra* note 35, at 635.

<sup>103</sup> *Too Much Too Soon*, *supra* note 27, at 395.

<sup>104</sup> Julia B. Wyman, *Climate Change Adaptation Strategies in New England*, in CLIMATE CHANGE IMPACTS ON OCEAN AND COASTAL LAW: U.S. AND INTERNATIONAL PERSPECTIVES 480 (Randall S. Abate ed., 2015); Sandra S. Nichols & Carl Bruch, *New Frameworks for Managing Dynamic Coasts: Legal and Policy Tools for Adapting U.S. Coastal Zone Management to Climate Change*, 1 SEA GRANT L. & POL’Y J. 19 (2008); Megan M. Herzog & Sean B. Hecht, *Combating Sea-Level Rise in Southern California: How Local Governments Can Seize Adaptation Opportunities While Minimizing Legal Risk*, 19 HASTINGS WEST-NORTHWEST J. ENVTL. L. & POL’Y 463 (2019).

explain, the lack of political will to drive stronger coastal adaptation.<sup>105</sup> There is a growing literature outlining the political and other barriers to delivering on the promise of adaptation plans and strategies. This literature draws principally from the experience of wealthy coastal nations, particularly the United States, and covers both the general limitations of current coastal management regimes<sup>106</sup> and the difficulties of specific state and local laws and policies to promote coastal adaptation.<sup>107</sup> Australia's experience suggests a similar set of barriers.<sup>108</sup>

The first challenge facing Australian coastal managers is the practical constraint on first-best adaptation planning because so much of the exposed coast is already heavily developed. Previous laws and decisions permitted extensive sub-division and development of the coastal foredunes that served as natural buffers. As these properties have steadily increased in value, it has created lock-in

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<sup>105</sup> Susanne C. Moser & Julia A. Ekstrom, *A Framework to Diagnose Barriers to Climate Change Adaptation*, 107 PROC. NAT'L ACAD. SCI. 22026 (2010); Lea Berrang-Ford, James D. Ford, & Jaclyn Paterson, *Are We Adapting to Climate Change?*, 21 GLOBAL ENVTL. CHANGE 25 (2011).

<sup>106</sup> E.g., Rosina Bierbaum et al., *A Comprehensive Review of Climate Adaptation in the United States: More than Before, but Less than Needed*, 18 MITIGATION & ADAPTATION STRATEGIES FOR GLOBAL CHANGE 361 (2012); Benjamin L. Preston, Richard M. Westaway, & Emma J. Yuen, *Climate Adaptation Planning in Practice: an Evaluation of Adaptation Plans from Three Developed Nations*, 16 MITIGATION & ADAPTATION STRATEGIES GLOBAL CHANGE 1407 (2011); Tim Measham et al., *Adapting to Climate Change through Local Municipal Planning: Barriers and Challenges*, 16 MITIGATION & ADAPTATION STRATEGIES GLOBAL CHANGE 889 (2011); ANNE SIDERS, SABIN CTR. FOR CLIMATE CHANGE L., COLUM. L. SCH., *MANAGED COASTAL RETREAT: A LEGAL HANDBOOK ON SHIFTING DEVELOPMENT AWAY FROM VULNERABLE AREAS* (2013).

<sup>107</sup> E.g., JUSTIN GUNDLACH & P. DANE WARREN, SABIN CTR. FOR CLIMATE CHANGE L., COLUM. L. SCH., *LOCAL LAW PROVISIONS FOR CLIMATE CHANGE ADAPTATION* (2016); Jesse Reiblich et al., *Enabling and Limiting Conditions of Coastal Adaptation: Local Governments, Land Uses, and Legal Challenges*, 22 OCEAN & COASTAL L.J. 156 (2017); Sara C. Aminzadeh, *Rising to the Challenge: California Coastal Climate Change Adaptation*, in CLIMATE CHANGE IMPACTS ON OCEAN AND COASTAL LAW: U.S. AND INTERNATIONAL PERSPECTIVES 533 (Randall S. Abate ed., 2015); Keith Richard, *Avoiding Unintended House Boats: Towards Sensible Coastal Land Use Policy in Massachusetts*, 48 NEW ENG. L. REV. 101 (2014); KENNETH T. KRISTL, ENVTL. AND NATURAL RES. L. CLINIC, WIDENER UNIV. SCH. OF L., *ASSESSING THE LEGAL TOOLBOX FOR SEA LEVEL RISE ADAPTATION IN DELAWARE: OPTIONS AND CHALLENGES FOR REGULATORS, POLICYMAKERS, PROPERTY OWNERS, AND THE PUBLIC* (2014); Kelley M Jancaitis, *Florida on the Coast of Climate Change: Responding to Rising Seas*, 31 ENVIRONS: ENVTL. L. & POL'Y J. 157 (2008); Megan Higgins, *Legal and Policy Impacts of Sea Level Rise to Beaches and Coastal Property*, 1 SEA GRANT L. & POL'Y J. 43 (2008); Jessica Grannis et al., *Coastal Management in the Face of Rising Seas: Legal Strategies for Connecticut*, 5 SEA GRANT L. & POL'Y J. 59 (2012); Sarah Burch, *Transforming Barriers into Enablers of Action on Climate Change: Insights from Three Municipal Case Studies in British Columbia, Canada*, 20 GLOBAL ENVTL. CHANGE 287 (2010).

<sup>108</sup> AUSTRAL. PRODUCTIVITY COMM., *supra* note 93.

or path dependency that makes it difficult for decision makers to initiate policies of retreat, or even avoidance of further exposure.<sup>109</sup> The key to political tractability of adaptation strategies is to develop options that are both affordable and that do not generate community outrage.<sup>110</sup> It is a brave council indeed that is willing to tell owners that their beachfront properties must be removed or allowed to fall into the sea. This is especially so in places where there have already been efforts at fortification that create an expectation of ongoing protection, including the construction of seawalls, dumping of rocks or car bodies, or temporary sandbagging.

The political difficulty is compounded by the recognition of so-called “existing use” rights in the planning regimes of all states and territories.<sup>111</sup> Where such rights exist, the options available to coastal managers are limited to restrictions on further protection, formal buyouts and acquisitions and voluntary encouragement to adapt or retreat.<sup>112</sup> While the *Belongil* litigation is the only case in which common law rights to protect property have been raised, conflicting views about the relative importance of public values and private property rights underpin many coastal adaptation challenges.<sup>113</sup> Most of the conflicts over coastal adaptation concern groups of private landowners asserting their private property rights over the wider public interest in preserving beach access or spending precious resources on other priorities.<sup>114</sup>

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<sup>109</sup> Frohlich et al., *supra* note 15; LIMP, LEAP OR LEARN, *supra* note 17; Allan W. Young, *How to Retreat: The Necessary Transition from Buyouts to Leasing*, 46 COASTAL MGMT. 527 (2018), <https://www.tandfonline.com/doi/full/10.1080/08920753.2018.1498716> (last visited Mar. 10, 2020); Jon Barnett et al., *From Barriers to Limits to Climate Change Adaptation: Path Dependency and the Speed of Change*, 20 ECOLOGY & SOC’Y 5 (2015), <https://doi.org/10.5751/ES-07698-200305> (last visited Mar. 10, 2020); Oona A. Hathaway, JOHN M. OLIN CTR. FOR STUD. IN LAW, ECON., & PUB. POL’Y WORKING PAPERS, PATH DEPENDENCE IN THE LAW: THE COURSE AND PATTERN OF LEGAL CHANGE IN A COMMON LAW SYSTEM (2003), [http://digitalcommons.law.yale.edu/lepp\\_papers/270](http://digitalcommons.law.yale.edu/lepp_papers/270) (last visited Mar. 10, 2020);

<sup>110</sup> Gibbs, *supra* note 14, at 135.

<sup>111</sup> Frohlich et al., *supra* note 15, at 5.

<sup>112</sup> *Id.* at 6.

<sup>113</sup> Thom, *supra* note 34, at 13.

<sup>114</sup> This is especially problematic in the state of New South Wales which, through historical legal anomaly, has a far higher proportion of coastal foreshore in private ownership than any other Australian state. Thom estimates 40–50% of coastal foreshore in private ownership in N.S.W., compared to just 10% in Victoria. Thom, *supra* note 34, at 13. *See also* Tayanah O’Donnell & Louise Gates, *Getting the Balance Right: A Renewed Need for the Public Interest Test in Addressing Coastal Climate Change and Sea Level Rise*, 30 ENVTL. PLAN. & L.J. 220 (2013).



The influence of these special interest groups on decision-making involving public interest values is profound, especially when accompanied by media coverage or threats of litigation.<sup>115</sup> A group of property owners affected by a decision forms a highly-concentrated coalition that has a strong interest in vocal opposition. By contrast, public values, both present and long term, are more dispersed across the community, and advocates are less well organized and often poorly represented in formal processes. The influence of special interest groups in environmental, land use, and natural resources planning is nothing new. Writing nearly half a century ago, Joseph Sax highlighted the need for the protection of “diffuse public interests” in the face of “tightly organised groups with clear and immediate goals.”<sup>116</sup> The power of such groups is arguably higher in Australia because the public trust doctrine has found neither legal nor political traction.<sup>117</sup> While many in the United States might debate whether the public trust doctrine is the best means by which to deliver efficient coastal adaptation,<sup>118</sup> there is little doubt that the absence of any common law protection affects local authorities’ willingness to undertake retreat-oriented adaptation strategies.<sup>119</sup>

A second barrier to adaptation planning in Australia is the mismatch between where responsibility has tended to lie - with local government - and the levels of government that have the technical resources and financial capacity to implement strategic approaches.<sup>120</sup> Under Australia’s federal arrangements, planning and coastal matters are a state responsibility. The involvement of the national government is limited to approving developments that might have impacts on “matters of national environmental significance,” - including Ramsar

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<sup>115</sup> Robb et al. report that 94% of surveyed local planners considered it likely that landholders would take political action or litigation against prohibitions on new protective structures and over 90% thought it likely that elected officials would support that opposition and lift restrictions. Robb et al., *supra* note 15, at 412.

<sup>116</sup> Joseph Sax, *The Public Trust Doctrine in Natural Resources Law: Effective Judicial Intervention*, 68 MICH. L. REV. 471, 556 (1970).

<sup>117</sup> Bruce Thom, *Climate Change, Coastal Hazards and the Public Trust Doctrine*, 8 MACQUARIE J. INT’L COMP. ENVTL. L. 21 (2012).

<sup>118</sup> Some suggest that by allowing for uncompensated redistribution, the public trust doctrine is resisted by current resource owners and results in a model of litigation and settlement among disputing parties which is more expensive than the purchase of private rights through market transactions. Jedidiah Brewer & Gary D. Libecap, *Property Rights and the Public Trust Doctrine in Environmental Protection and Natural Resource Conservation*, 53 AUSTRALIAN J. AGRIC. & RESOURCE ECON. 1 (2009).

<sup>119</sup> Gurran et al., *supra* note 13, at 106 (quoting Thom, *supra* note 34).

<sup>120</sup> LIMP, LEAP OR LEARN, *supra* note 17; AUSTL. GOV’T, NATIONAL CLIMATE CHANGE ADAPTATION FRAMEWORK (2007); AUSTL. GOV’T, ADAPTING TO CLIMATE CHANGE IN AUSTRALIA: AN AUSTRALIAN GOVERNMENT POSITION PAPER (2010).

wetlands<sup>121</sup> - and to providing funding for priority initiatives. States set broad policies and frameworks, then devolve local planning and development decisions to local government, thereby giving “effect to the subsidiarity principle, which provides that government functions should be performed at the lowest level possible for ensuring effectiveness.”<sup>122</sup> This is considered appropriate because climate impacts vary from place to place and the appropriate response may be site-specific.<sup>123</sup>

The devolution of adaptation decisions to local government is problematic for a number of reasons. These include the heightened susceptibility of local government to special interest forces<sup>124</sup> and its narrow (local) conception of the “public interest.”<sup>125</sup> While these issues affect all aspects of adaptation planning, they are especially problematic when coastal regions have values that are nationally important. Devolving strategic coastal planning to local governments also means that opportunities for efficiency and confidence-building across the wider community are lost. While there are exceptions across the country, many local authorities report a strong preference for state government leadership in identifying areas where coastal fortification should be permissible or prohibited, and the criteria for assessing applications for constructing protective structures.<sup>126</sup> It is clear that effective, equitable, and durable coastal adaptation planning will require collaboration among all three levels of government.

Expecting local governments to carry the coastal adaptation load also assumes that the level of government to which responsibility is allocated has the resources and capacity to design and implement meaningful adaptation measures, which may not be the case.<sup>127</sup> In fact, local governments in Australia have very

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<sup>121</sup> See *EPBC Act- Frequently Asked Questions*, AUSTRALIAN GOVERNMENT, DEPT. OF AGRIC., WATER, AND THE ENVIRONMENT, <https://www.environment.gov.au/epbc/publications/factsheet-epbc-act-frequently-asked-questions> (last visited Mar. 10, 2020).

<sup>122</sup> RESEARCH HANDBOOK ON CLIMATE CHANGE ADAPTATION POLICY 73 (E.C.H. Keskitalo & B.L. Preston, eds, 2019).

<sup>123</sup> AC Foerster et al., *Trade-Offs in Adaptation Planning: Protecting Public Interest Environmental Values*, 27 J. OF ENVTL. L. 459, 476 (2015).

<sup>124</sup> Gurran et al., *supra* note 13, at 104; Michael Bradley et al., *The Pace and Progress of Adaptation: Marine Climate Change Preparedness in Australia's Coastal Communities*, 53 MARINE POL'Y 13 (2015).

<sup>125</sup> Foerster et al., *supra* note 127, at 486.

<sup>126</sup> LIMP, LEAP OR LEARN, *supra* note 17; Robb et al., *supra* note 15, at 414; Frohlich et al., *supra* note 15, at 10.

<sup>127</sup> B.M. Taylor et al., *Scaling-Up, Scaling-Down, and Scaling-Out*, 51 GEOGRAPHICAL RESEARCH 292, 300 (2013).

little capacity to raise additional funds to do “good” coastal planning. Well-funded municipalities with large rate-bases can pay for expert site-specific data, while in others, council officers are left to make sense of publicly-available information. It is often inefficient to have adjoining coastal councils engage in separate data collection and engagement processes. More problematic is the risk that one council could plan in such a way as to transfer risks to the coastal assets of an adjacent council. There are also important equity concerns for small municipalities that simply cannot afford the cost of this mapping, consultation, and implementation. Resource constraints are amplified when it comes to paying for the implementation of elements of such plans, such as buyouts or forms of hard or soft protection.

States have more capacity to fund coastal adaptation, but the federal government is best placed to fund coordinated efforts. Yet the federal government sees its role as limited to “leadership, information and research support” for action by sub-national governments.<sup>128</sup> While this makes sense from the perspective of local knowledge and a focus on local solutions,<sup>129</sup> it ignores local government resource constraints and their calls for a stronger role for Commonwealth and state policy.<sup>130</sup> The implementation gap created by this fiscal mismatch is not unique to Australia,<sup>131</sup> but the precarious legal status of local government (as creatures solely of state legislation) and Australia’s Constitutional allocation of powers compound these challenges.

A third, related, barrier to effective adaptation planning is the preoccupation of local government with exposure to litigation.<sup>132</sup> This fear of

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<sup>128</sup> AUSTRALIAN PRODUCTIVITY COMMISSION, *supra* note 93 (cited in Gurran et al., *supra* note 13, at 102); AUSTRALIAN LOCAL GOVERNMENT ASSOCIATION, SELECT COUNCIL ON CLIMATE CHANGE, ROLES AND RESPONSIBILITIES FOR CLIMATE CHANGE ADAPTATION IN AUSTRALIA (2012); LIMP, LEAP OR LEARN, *supra* note 17.

<sup>129</sup> Lea Berrang-Ford et al., *A Systematic Review of Observed Climate Change Adaptation in Developed Nations*, 106 CLIMATE CHANGE 327 (2011); Gurran et al., *supra* note 13, at 101.

<sup>130</sup> Gurran et al., *supra* note 13, at 107.

<sup>131</sup> This is consistent with local governmental coastal adaptation planning across the developed world. Berrang-Ford et al., *supra* note 133; Gurran et al., *supra* note 13, at 101.

<sup>132</sup> Jan McDonald, *A Risky Climate for Decision-Making: The Liability of Development Authorities for Climate Change Impacts*, 24 ENVTL. & PLAN. L.J. 405 (2007); NICOLA DURRANT, LEGAL RESPONSES TO CLIMATE CHANGE Ch. 20 (2010); BAKER & MCKENZIE, LOCAL COUNCILS’ RISK OF LIABILITY IN THE FACE OF CLIMATE CHANGE – RESOLVING UNCERTAINTIES: A REPORT FOR THE AUSTRALIAN LOCAL GOVERNMENT ASSOCIATION 41 (2011); Rahul Thyagarajan, *Constructing a Negligence Case under Australian Law against Statutory Authorities in Relation to Climate Change Damages*, 8 CARBON & CLIMATE L. REV. 208 (2014); C. Warnock, *Global Atmospheric Pollution: Climate Change and Ozone*, in ENVIRONMENTAL LAW IN NEW ZEALAND

litigation relates to decisions to approve new developments in hazard prone areas (litigation in tort by future residents),<sup>133</sup> decisions to refuse developments in hazard prone areas (planning appeals by property developers),<sup>134</sup> decisions to remove or not maintain existing protection structures (tort actions by existing residents), and decisions either to upgrade existing or install new structures (brought by community members).<sup>135</sup> Concerns over legal exposure are largely unfounded, given the higher standard of negligence that must be demonstrated to establish liability. In assessing conduct, courts will evaluate the budgetary position of the authority and the other public interest considerations it must take into account.<sup>136</sup> Liability is unlikely, though admittedly not impossible. For example, where a local authority creates conditions which exacerbate coastal erosion, there may be a high expectation that it will ameliorate these risks, and failure to do so could constitute actionable negligence. Simply refusing to protect coastal homes, or to permit landholders to do so, is unlikely to constitute actionable negligence, however, in the absence of additional factors.

This fear is particularly unfounded in New South Wales, which is where most of the litigation has occurred. The 1993 New South Wales *Local Government Act* contains a novel provision that shields local government from liability for decisions and actions relating to coastal land that are done in good faith.<sup>137</sup> The Act establishes a rebuttable presumption of good faith for councils that substantially comply with the state government's coastal management manual. This qualified protection should give local authorities the confidence to implement local adaptation policy,<sup>138</sup> although some authors have also noted its

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789, 822 (P. Salmon & D. Grinlinton, eds., 2015); T. O'Donnell, *Legal Geography and Coastal Climate Change Adaptation: the Vaughn Litigation*, 54 GEOGRAPHICAL RESEARCH 301 (2016).

<sup>133</sup> See generally McDonald, *supra* note 136; BAKER & MCKENZIE, *supra* note 136, at 41; Philippa England, *Heating Up: Climate Change Law and the Evolving Responsibilities of Local Government*, 13 LOC. GOV'T L.J. 209 (2008).

<sup>134</sup> E.g., *Taip v E. Gippsland Shire Council* [2010] 177 LGERA 236; *Gippsland Coastal Bd. v S. Gippsland Shire Council* [2008] VCAT 1545; *Northcape Properties v Dist. Council of York Peninsula* [2008] SASR 57; *Minister for Planning v Walker* [2008] 161 LGERA 423; *Myers v S.3 Gippsland Shire Council* (No. 2) [2009] VCAT 2414; *Aldous v Greater Taree City Council* [2009] NSWLEC 17; *Ronchi v Wellington Shire Council* [2009] VCAT 1206.

<sup>135</sup> See *supra* Part III:C for a discussion of the Belongil beach litigation.

<sup>136</sup> See, e.g., *Civil Liability Act 2002* (NSW) ss 42–46 (Austl.) and equivalent provisions in other jurisdictions; BAKER & MCKENZIE, *supra* note 163, at 41.

<sup>137</sup> *Local Government Act 1993* (NSW) s 733 (Austl.). It also protects local authorities in respect of decisions relating to flood-prone or bushfire-prone land.

<sup>138</sup> Lipman & Stokes, *supra* note 17, at 195

potential for reducing accountability for maladaptive behavior that has substantial longer-term financial consequences.<sup>139</sup>

In practice, however, local government concern over litigation relates not only to the possible outcome, but to the costs of having to defend expensive actions, especially for very small councils with a limited rate base. Indeed, even the prospect of having to defend an action brought by a disgruntled landowner has led local authorities to adopt strategies that entrench the status quo and limit future adaptation options, as has occurred in Byron Shire.<sup>140</sup> The financial cost of fighting litigation combined with the political backlash generated by media attention on the case constitute deterrent enough.

Interestingly, despite local government's aversion to litigation, coastal adaptation planning cases heard to date have made a significant contribution to our understanding of what is needed. The formal precedent value of planning appeal decisions involving coastal adaptation issues is necessarily limited by the merits-review nature of the litigation, but they demonstrate several aspects of the current state of coastal adaptation planning in Australia. First, they both reflect and drive an increased awareness of the need for long-term adaptation planning of our coasts. Second, they highlight the importance of strong legal and policy frameworks for decision-making. Decisions that tend to curtail development rights have been easier to sustain where they are supported or mandated by strong legal requirements. Third, some cases show that courts can facilitate and expedite adaptation by overcoming legislative inertia in the way that they interpret and apply existing provisions.<sup>141</sup> Finally, the different approaches of courts across the country also highlight the challenge of consistency across Australia's vast coastline.

In light of past experience and this recognition of the significant financial, legal, and political barriers to coastal adaptation, the final section of this article considers how Australia might improve its response to the challenge of rising seas.

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<sup>139</sup> Bell & Baker-Jones, *supra* note 15, at 34.

<sup>140</sup> See *supra* Part III:C for a discussion of the Belongil beach litigation.

<sup>141</sup> Joseph Wenta & Jan McDonald, *The Role of Law and Legal Systems in Climate Change Adaptation Policy*, in RESEARCH HANDBOOK ON CLIMATE CHANGE ADAPTATION POLICY 69 (E.C.H. Keskitalo & B.L. Preston eds., 2019); Jacqueline Peel & Hari M. Osofsky, *Sue to Adapt?*, 99 MINN. L. REV. 2177, 2246 (2015).

**VI. CONCLUSION - FUTURE PRIORITIES FOR COASTAL CLIMATE ADAPTATION IN AUSTRALIA**

If integrated, adaptive coastal management were easy, Australia's planning towards such management would have made it a world leader. Based on research and planning following the first government inquiry into the need for new approaches, it would have implemented sweeping reforms four decades ago. To date, however, the challenges of harnessing and coordinating priorities across three levels of government and multiple competing sectors of users of the coastal zone have so far proved insurmountable. This demands that we learn from past failures and reasons for slow progress.

Australian coastal managers and planners do not suffer from a lack of tools, laws, policies, or plans to implement coastal adaptation.<sup>142</sup> There is a wealth of statements about the importance of forward-looking planning decisions that reduce or, at least do not increase, exposure to coastal hazards. What is lacking is the resources and capacity to move from planning to implementation of the hierarchy of adaptation options identified in policy documents. This demands more consistent funding for coastal adaptation amongst many competing adaptation priorities, such as drought and bushfire management.

Improved coastal adaptation also requires political consistency and courage. Such courage might come from a recognition that the accelerating rate of sea level rise will compromise the effectiveness of coastal protection sooner than expected. Scaling back the timescale over which protections are expected to be effective will alter the cost-benefit equation for persisting with such efforts. A public accounting and recognition of what will be lost if we choose certain pathways will also help frame longer-term acceptance that impacts on both public values and private property rights are unavoidable.

Implementation would also be easier if decision makers progressed from simply calculating adaptation costs and benefits to deciding how these costs should be allocated across the community and across time. For example, requiring property owners to provide financial assurances that they will continue to cover the costs of sand nourishment to offset beach loss caused by their protective works might change their perspective on whether such measures are really worthwhile.

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<sup>142</sup> Jan McDonald & Megan Styles, *Legal Strategies for Adaptive Management Under Climate Change*, 26 J. ENVTL. L. 25 (2014).

It is tempting to hope that Australian coastal managers will be jolted into action by the occurrence of one of two more severe storm erosion events; that this will be the window of policy opportunity that enables a nationwide realization that our coastline will change dramatically over the decades ahead.<sup>143</sup> Yet Australian coastal managers have so far done a poor job of learning from the experience of others. In fact, in recent years, the government response to extensive damage from tropical cyclones or east-coast low pressure systems has been to commit publicly to long-term protection, even in areas with a long history of erosion.<sup>144</sup> Such political opportunism may garner support from those powerful few whose properties are directly affected, but it significantly compromises the capacity to undertake long-term planning.

While students of Australian coastal adaptation might hope for such transformative moments, it seems far more likely that progress will continue to be iterative, and likely to always be playing catch up. As the impacts of climate change are felt across all aspects of Australia's physical environment, economy, and society, competition for limited resources will only increase. This is likely to include tensions between competing claims for compensation or support from private interests, be it farmers arguing for drought assistance or farm buy-outs, urban communities' efforts to combat urban heat island effects, or peri-urban communities exposed to bushfire risk. Among these competing claims, it is imperative that Australian policy does not lose sight of the public values of our coastline. These values must inform adaptation decision-making in the future, even if sea level rise threatens to wash some of them away.

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<sup>143</sup> Indeed, some suggest a deliberate strategy on the part of some councils to adopt a wait-and-see approach that is more likely to allow for "retreat cost-shifting" if landowners end up bearing the responsibility to demolish structures that pose a risk to public safety. Frohlich et al., *supra* note 15 (citing Young, *supra* note 113).

<sup>144</sup> The cyclone building standards introduced after Cyclone Yasi hit the coast of far North Queensland were downgraded from standards to guidelines to alleviate the financial burden for property owners. They imposed no duty to "build back better." Similarly, when an extreme weather event caused extensive damage to beachfront properties and a local surf lifesaving club at Sydney's Collaroy-Narrabeen beaches, the state government immediately supported the installation of temporary beach protection works. This undermined years of council negotiation, dating back to the 1960s, that sought to consider the opposition of the wider local population to coastal protection. In 2002, about 3,000 residents formed a 1 km 'human wall' along the beach to protest against the construction of an engineered sea wall. Thom, *supra* note 121.

ENVISIONING NATURE’S RIGHT TO A STABLE CLIMATE SYSTEM

Grant Wilson<sup>1</sup>

I. INTRODUCTION

This article introduces the concept of Rights of Nature and explores its potential to help address climate change. First, it provides a brief summary of emerging climate change threats. Second, it highlights the failure of international law to adequately address climate change. Third, the article argues that the Rights of Nature movement can serve as a useful tool to address climate change, such as by giving nature a voice at climate change negotiations. Finally, the article highlights island nations as possible flag-bearers for one subset of the Rights of Nature movement: nature’s fundamental right to a stable climate system (or “right to a stable climate” for short).

II. OVERVIEW OF CLIMATE CHANGE THREATS

Climate change, along with biodiversity loss and other global environmental emergencies, is perhaps the greatest challenge ever faced by humanity. The situation is dire: sea-level rise already of six to eight inches in some ocean basins; the threat of over three feet of sea level rise by 2100 and twelve feet by 2300;<sup>2</sup> an increase in the frequency and severity of drought, heat waves, wildfires, and other extreme weather events;<sup>3</sup> 250,000 human deaths per

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<sup>1</sup> Grant Wilson is the Executive Director and Directing Attorney of Earth Law Center, [www.earthlawcenter.org](http://www.earthlawcenter.org). Research and writing support from Earth Law Center Associates Dalit Paradis, Paris Marler, and Oliver Porter.

<sup>2</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT ON THE OCEAN AND CRYOSPHERE IN A CHANGING CLIMATE: SUMMARY FOR POLICYMAKERS (2019) [hereinafter IPCC], available at <https://www.ipcc.ch/srocc/chapter/summary-for-policymakers> (last visited Mar. 7, 2020).

<sup>3</sup> Donald Wuebbles, David W. Fahey & Kathy A. Hibbard, *How Will Climate Change Affect the United States in Decades to Come?*, EARTH & SPACE SCI. NEWS, Nov. 3, 2017, available at <https://eos.org/features/how-will-climate-change-affect-the-united-states-in-decades-to-come> (last visited Mar. 7, 2020).



year (and rising);<sup>4</sup> and nearly one in six species facing extinction due to climate change.<sup>5</sup>

The outlook is especially grim for island nations and marine ecosystems. A 2019 oceans report by the Intergovernmental Panel on Climate Change (IPCC) reaffirmed that some island nations will likely become uninhabitable due to climate-related changes to the ocean and cryosphere (i.e., the Earth's frozen water).<sup>6</sup> The report also found that “[a]lmost all warm-water coral reefs are projected to suffer significant losses of area and local extinctions, even if global warming is limited to 1.5 degrees Celsius.”<sup>7</sup> Amongst the specific threats faced by coral reefs and other marine life is ocean acidification, with marine waters already being 30% more acidic than preindustrial levels due to excess carbon being sequestered from the atmosphere. In sum, island nations and marine ecosystems both face existential threats.

Experts increasingly advocate for fundamental societal transformations in order to tackle climate change. A seminal IPCC report in 2018 found that limiting the global temperature increase to below 1.5 degrees Celsius - commonly recognized as the upper limit to avoid some of the worst impacts of climate change - “would require rapid, far-reaching and unprecedented changes in all aspects of society.”<sup>8</sup> Additionally, a May 2019 United Nations “mega-report” on biodiversity loss concluded that efforts to protect individual species are no longer sufficient, calling repeatedly – *twenty-one separate times* - for “transformative change” to restore, create, and safeguard a sustainable environment for humans and nature.<sup>9</sup>

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<sup>4</sup> *The Impact of Global Warming on Human Fatality Rates*, SCIENTIFIC AM., June 17, 2009, available at <https://www.scientificamerican.com/article/global-warming-and-health/> (last visited Mar. 7, 2020).

<sup>5</sup> Mark C. Urban, *Accelerating Extinction Risk from Climate Change*, 348 SCI. 571 (2015), available at <https://science.sciencemag.org/content/348/6234/571> (last visited Mar. 7, 2020).

<sup>6</sup> IPCC, *supra* note 2.

<sup>7</sup> *Id.*

<sup>8</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS OF IPCC SPECIAL REPORT ON GLOBAL WARMING OF 1.5°C APPROVED BY GOVERNMENTS (2018), available at <https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/> (last visited Mar. 7, 2020).

<sup>9</sup> UNITED NATIONS' INTERGOVERNMENTAL SCI.-POLICY PLATFORM ON BIODIVERSITY AND ECOSYSTEM SERVICES, GLOBAL ASSESSMENT REPORT ON BIODIVERSITY AND ECOSYSTEM SERVICES (2019), available at <https://ipbes.net/global-assessment-report-biodiversity-ecosystem-services> (last visited Mar. 7, 2020).

### III. FAILURE OF THE LEGAL SYSTEM TO TACKLE CLIMATE CHANGE

So, how are we doing? During the 2019 Climate Change Negotiations in Madrid (“COP 25”), member states gathered in the wake of a growing climate disaster: unprecedented wildfires roared in Australia; the hottest decade on record (the 2010s) drew to a close; more than 1,400 local governments had recently declared a climate emergency;<sup>10</sup> and worldwide, millions of people marched just weeks before demanding “an end to the age of fossil fuels.”<sup>11</sup> The science was irrefutable and many people were uproarious.

Despite this cry for help from the Earth and its people, the negotiations faltered. The member states failed to agree to a nonbinding commitment ratcheting up their already-insufficient pledges to reduce CO<sub>2</sub> emissions. The states also failed to reach a deal to regulate carbon markets as they had hoped.<sup>12</sup> “The final result is low, very low,” said IPCC vice-chair Jean-Pascal van Ypersele on Twitter.<sup>13</sup> Meanwhile, the United States - the highest per capita CO<sub>2</sub> emitter in the world - will formally withdraw from the Paris Climate Agreement in 2020.

The gap between what is required to solve climate change and the current trajectory of climate change talks is shockingly large. Even if all countries met their current commitments, which seems nearly impossible at this juncture, it would not be enough to stave off the worst impacts of climate change.<sup>14</sup> The status quo has failed. The only solution to these seemingly insurmountable problems is perhaps the phrase cited repeatedly in the 2019 United Nations’ mega-report on biodiversity: transformative change.

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<sup>10</sup> Bruno Sarda, *Climate Change is Already Wreaking Havoc in Cities. Here’s How They Need to Step Up*, ETHICAL CORP., Jan. 3, 2020, available at <http://www.ethicalcorp.com/climate-change-already-wreaking-havoc-cities-heres-how-they-need-step> (last visited Mar. 7, 2020).

<sup>11</sup> Haley Ott, *Millions Hit the Streets for Global Climate Change Strike*, CBS NEWS, Sept. 20, 2019, available at <https://www.cbsnews.com/live-news/global-climate-change-strike-protests-today-2019-09-20-live-updates> (last visited Mar. 7, 2020).

<sup>12</sup> Alasdair Fotheringham, *COP25 Summit Fails to Address Key Carbon Markets Issue*, AL JAZEERA, Dec. 15, 2019, available at <https://www.aljazeera.com/news/2019/12/cop25-summit-fails-address-key-carbon-markets-issue-191215145030619.html> (last visited Mar. 7, 2020).

<sup>13</sup> David Wallace-Wells, *U.N. Climate Talks Collapsed in Madrid. What’s the Way Forward?*, N.Y. MAGAZINE, Dec. 16, 2019, available at [www.nymag.com/intelligencer/2019/12/cop25-ended-in-failure-whats-the-way-forward.html](http://www.nymag.com/intelligencer/2019/12/cop25-ended-in-failure-whats-the-way-forward.html) (last visited Mar. 7, 2020).

<sup>14</sup> Michael B. Gerrard, *Sadly, the Paris Agreement Isn’t Nearly Enough*, 6 ENVIRONMENTAL FORUM 57 (2016), available at <http://columbiaclimatelaw.com/files/2016/10/Gerrard-2016-10-Paris-Agreement-Isnt-Nearly-Enough.pdf> (last visited Mar. 7, 2020).

But if not the current approach, then what? A growing number of countries are turning to the Rights of Nature movement as a solution to root causes of environmental declines. This transformative legal movement is discussed in the subsequent sections.

#### IV. INTRODUCTION TO THE RIGHTS OF NATURE

Rights of Nature (also commonly “the Rights of Nature,” “Rights of Mother Earth,” or “Earth Rights”) asserts that nature possesses certain fundamental rights, just like humans. The premise of Rights of Nature is that nature has inherent worth separate and distinct from its benefits to humans, a worldview held by Indigenous peoples for millennia.<sup>15</sup> Rights of Nature is part of a growing body of ecocentric legal movements sometimes called Earth law.

According to Thomas Berry, a religious and ecological scholar whose theory of Earth jurisprudence underpins much of the modern Rights of Nature movement, every member of the Earth community holds at least three specific rights: “the right to be, the right to habitat and the right to fulfill its role in the ever-renewing processes of the Earth community.”<sup>16</sup> Many Rights of Nature advocates assert that nature’s rights are inherent to its existence.<sup>17</sup> This same reasoning has been used to justify the origin of human rights, which the drafters

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<sup>15</sup> See MOVEMENT RIGHTS, RIGHTS OF NATURE & MOTHER EARTH: RIGHTS-BASED LAW FOR SYSTEMIC CHANGE, (Shannon Biggs et al. eds., 2017), available at <https://www.ienearth.org/wp-content/uploads/2017/11/RONME-RightsBasedLaw-final-1.pdf> (last visited Mar. 8, 2020); see also Osprey Orielle Lake, *Recognizing the Rights of Nature and the Living Forest*, in RIGHTS OF NATURE & MOTHER EARTH: RIGHTS-BASED LAW FOR SYSTEMIC CHANGE 20 (Shannon Biggs et al. eds., 2017), available at <http://www.uky.edu/~tmute2/GEI-Web/password-protect/GEI-readings/Lake-Rights-of-Living-Forest.pdf> (last visited Mar. 8, 2020).

<sup>16</sup> The concept of Earth community is used by Thomas Berry. “According to this concept, human beings are one interconnected part of a broader community of life. All parts of this community are subjects and have value. Berry uses the concept of Earth community as a platform to advocate for the extension of ethics beyond interpersonal human relationships to include the comprehensive Earth community.” See Peter D. Burdon, *The Earth Community and Ecological Jurisprudence*, 3(5) OÑATI SOCIO-LEGAL SERIES 815, 818 (2013).

<sup>17</sup> As argued by Thomas Berry, “that which determines existence determines rights.” *Thomas Berry’s Ten Principles of Jurisprudence*, GLOBAL ALLIANCE FOR THE RIGHTS OF NATURE, <https://therightsofnature.org/thomas-berrys-ten-principles-of-jurisprudence> (last visited Mar. 8, 2020).

of the United Nations' Universal Declaration of Human Rights found “. . . did not originate in the decision of a worldly power, but rather in the fact of existing.”<sup>18</sup>

A flurry of constitutional amendments, laws, and court decisions have recently recognized the Rights of Nature. In 2008, Ecuador became the first country to formally include the Rights of Nature in its constitution, proclaiming that “Nature or Pachamama, where life is reproduced and exists, has the right to exist, persist, maintain and regenerate its vital cycles, structure, functions and its processes in evolution.”<sup>19</sup> Furthermore, it gives all Ecuadorians legal standing to enforce the Rights of Nature.

Since its recognition, dozens of courts in Ecuador have considered the Rights of Nature. In many instances, judges upheld nature's constitutional rights. One such instance was when the Vilcabamba River, as the named plaintiff, secured its own restoration after suffering harm due to a road construction project.<sup>20</sup> Another is the use of Rights of Nature to defend sharks in the Galapagos Marine Reserve.<sup>21</sup> However, in other cases, courts found short-term economic interests outweigh ecosystem protections. In the “Condor-Mirador” mine case, a provincial court ruled that the mine did not violate the Rights of Nature, despite the mine's severe negative impacts to the Amazon Rainforest, reasoning that the project served the public interest.<sup>22</sup>

While many Rights of Nature advocates hoped for a broader application of the legal movement in Ecuadorian courts than has occurred, gradual adoption and acceptance is to be expected for a new rights-based movement. Many human rights - civil rights, women's rights, immigrant rights, and others - are litigated in courts today, and not always successfully, even decades or centuries after first being recognized by the court. As Theodore Parker and later Martin Luther King Jr. said, “The arc of the moral universe is long, but it bends toward justice.”<sup>23</sup>

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<sup>18</sup>*Universal Declaration of Human Rights - History of the Document*, UNITED NATIONS, <https://www.un.org/en/sections/universal-declaration/history-document/index.html> (last visited Mar. 8, 2020).

<sup>19</sup> ECUADOR CONST. TIT. II, CH. 7.

<sup>20</sup> See Craig M. Kauffman & Pamela Martin, *Testing Ecuador's Rights of Nature: Why Some Lawsuits Succeed and Others Fail*, INT'L STUDIES ASSOC. ANNUAL CONV. (2016).

<sup>21</sup> *Id.*

<sup>22</sup> *Id.*

<sup>23</sup> Melissa Block & Clayborne Carson, *Theodore Parker and The 'Moral Universe'*, NPR, Sept. 2, 2010, available at <https://www.npr.org/templates/story/story.php?storyId=129609461> (last visited Mar. 8, 2020).

Additionally, even with varying acceptance by the courts, Rights of Nature is now part of the national discourse in Ecuador.<sup>24</sup> The voice of nature is being heard.

Ecuador's success has inspired other actors around the world. In 2010, Bolivia held the World People's Conference on Climate Change and the Rights of Mother Earth in Cochabamba. This gathering included over 35,000 people representing 140 countries - civil society leaders, fifty-six governmental delegations, Indigenous peoples, climate activists, and others—all of whom sought bold collective action after the failures of the 2009 Climate Change Conference in Copenhagen ("COP 15").<sup>25</sup>

Amongst the initiatives presented at the World People's Conference was a Universal Declaration for the Rights of Mother Earth (UDRME), which called for the United Nations and all countries to recognize the Rights of Nature. The UDRME's Preamble recognizes the "critical importance and urgency of taking decisive, collective action to prevent humans causing climate change and other impacts on Mother Earth that threaten the wellbeing [sic] and survival of humans and other beings."<sup>26</sup> Article II then establishes those basic rights held by Mother Earth: "to exist, to persist and to continue the vital cycles, structures, functions and processes that sustain all beings." While nonbinding, the UDRME has inspired the passage of Rights of Nature laws worldwide.<sup>27</sup>

This international shift has inspired jurisdictions around the world to acknowledge the Rights of Nature. In 2017, the New Zealand Parliament passed a Treaty bill recognizing the Whanganui River (or "Te Awa Tupua") as a legal person, making it the first river outside of Ecuador to ever be recognized as a legal person. This was the result of a 150-year effort by the Maori people to achieve legal recognition of the Whanganui River as their ancestor. While this victory was more a unique manifestation of Māori culture and beliefs rather than a continuation of the Rights of Nature movement, it still inspired others to evolve river protections.

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<sup>24</sup> See Kauffman & Martin, *supra* note 20.

<sup>25</sup> WORLD PEOPLE'S CONFERENCE ON CLIMATE CHANGE AND THE RIGHTS OF MOTHER EARTH, UNIVERSAL DECLARATION OF THE RIGHTS OF MOTHER EARTH (2010), available at <http://therightsofnature.org/universal-declaration> (last visited Mar. 8, 2020).

<sup>26</sup> *Id.* at Preamble.

<sup>27</sup> *Id.* at ART. II.

More courts have also begun to recognize the Rights of Nature, even without corresponding legislation. In 2017, the High Court of Uttarakhand in India granted legal personhood to the Ganges and Yamuna Rivers,<sup>28</sup> although the Supreme Court of India has stayed the decision while they make a final ruling.<sup>29</sup> In Colombia, numerous courts have recognized the rights of at least eight rivers and/or river basins,<sup>30</sup> including the Atrato River Basin, which the Constitutional Court held to be an “entity subject to rights to protection, conservation, maintenance and restoration by the State and ethnic communities.”<sup>31</sup>

In 2019, building upon the Atrato River decision, Colombia’s Supreme Court of Justice issued a landmark decision addressing climate change in the country.<sup>32</sup> With support from civil society group Dejusticia, twenty-five young persons sued the government, alleging violations of their human rights to life, health, and enjoyment of a healthy environment. These allegations were based on the government’s failure to protect the Amazon against deforestation and other environmental degradation, which contributed to global climate change. The Supreme Court of Colombia declared that “for the sake of protecting this vital ecosystem for the future of the planet” it would “recognize the Colombian Amazon as an entity, subject of rights, and beneficiary of the protection, conservation, maintenance and restoration.”<sup>33</sup> The Court also recognized the human right to a healthy environment and the rights of future generations.<sup>34</sup> Finally, the Court crafted strong remedies to combat deforestation and other

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<sup>28</sup> See Mohd. Salim v. State of Uttarakhand & Others, Writ Petition (PIL) No.126 of 2014 (Uttarakhand H.C. 2017), available at <https://www.nonhumanrights.org/content/uploads/WPPIL-126-14.pdf> (last visited Mar. 8, 2020). The court recognized that the Rivers are sacred to the Hindu community in India, as well as necessary to sustain the physical health and wellbeing of the population. The Indian court also acknowledged the importance of granting legal representation to non-sentient entities that perform essential and culturally valued functions within their community as a way to protect them and safeguard against their destruction.

<sup>29</sup> *Rivers Do Not Have Same Rights as Humans: India's Top Court*, PHYS.ORG, <https://phys.org/news/2017-07-rivers-rights-humans-india-court.html> (last visited Mar. 8, 2020).

<sup>30</sup> These rivers and/or river basins include: the Atrato River Basin (2016, Constitutional Court); the Plata River (2019, Colombian Municipal Civil Court of La Plata); three rivers in Tolima including the Coello, Combeima, and Cocora (2019, Administrative Tribunal Court of Tolima); the Cauca River Basin (2019, Superior Court of Medellín); the Pance River Basin (2019, Third Court of Enforcement of Sentences and Security Measures of Cali); and the River Otún (2019, Fourth Penal Enforcement Court of Pereira).

<sup>31</sup> Corte Constitucional [C.C.] [Constitutional Court], Sala Sexta de Revision, noviembre 10, 2016, M.P.: J. Palacio, Expediente T-5.016.242 (Colom.).

<sup>32</sup> Corte Suprema de Justicia [C.S.J.] [Supreme Court], April 5, 2018, STC 4360-2018 (Colom.).

<sup>33</sup> *Id.*

<sup>34</sup> *Id.*

climate change drivers, including an order that the Presidency of the Republic of Colombia and relevant agencies develop short, medium, and long-term action plans that reduce the deforestation of the Amazon to net zero.<sup>35</sup>

Other countries have also recognized Rights of Nature. In Mexico, the States of Colima and Guerrero, along with Mexico City, have recognized the Rights of Nature,<sup>36</sup> and the State of Mexico is now considering passing a similar law or constitutional amendment.<sup>37</sup> Bangladesh has recognized the rights of all rivers, granting them the same legal status as humans.<sup>38</sup> In 2019, Uganda included Rights of Nature in its new National Environmental Act.<sup>39</sup> Meanwhile, other countries have taken similar approaches to Rights of Nature by advancing “ecocentric” (as opposed to anthropocentric, or human-centered) legal movements that protect and restore ecosystems. For example, El Salvador recently passed a national proclamation declaring forests to be “living entities” and requiring humans to care for, preserve, respect, and expand forests within the country.<sup>40</sup> Many of these legal efforts are discussed and compiled annually at the Interactive Dialogues of the General Assembly on Harmony with Nature and through United Nations General Assembly resolutions on Harmony with Nature.<sup>41</sup>

In the United States, Native Americans are on the forefront of the Rights of Nature movement, in accordance with their longstanding cultures and belief systems. In 2019, the Yurok Tribe passed a resolution recognizing, amongst other rights, the Klamath River’s rights to exist, flourish, and naturally evolve and to

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<sup>35</sup> *Id.*

<sup>36</sup> Press Release, Earth Law Center, State of Colima, Mexico Makes History by Granting Constitutional Rights of Nature (Jul. 30, 2019), available at <https://www.prlog.org/12781903-state-of-colima-mexico-makes-history-by-granting-constitutional-rights-of-nature.htm> (last visited Mar. 8, 2020).

<sup>37</sup> *Unen Voces Especialistas y Científicos Para Crear Legislación Por el Medio Ambiente*, AD POLÍTICA, <https://adnoticias.mx/2019/08/19/unen-voces-especialistas-y-cientificos-para-crear-legislacion-por-el-medio-ambiente-1028776/> (last visited Mar. 8, 2020).

<sup>38</sup> Ashley Westerman, *Should Rivers Have Same Legal Rights as Humans? A Growing Number Of Voices Say Yes*, NPR, Aug 3., 2019, available at <https://www.npr.org/2019/08/03/740604142/should-rivers-have-same-legal-rights-as-humans-a-growing-number-of-voices-say-ye> (last visited Mar. 9, 2020).

<sup>39</sup> *Uganda Recognises [sic] the Right of Nature*, SUSTAIN, [https://www.sustainweb.org/news/apr19\\_uganda](https://www.sustainweb.org/news/apr19_uganda) (last visited Mar. 8, 2020).

<sup>40</sup> Press Release, Earth Law Center, Pronouncement in El Salvador Deems Forests to be Living Entities (June 6, 2019), <https://www.earthlawcenter.org/elc-in-the-news/2019/6/pronouncement-in-el-salvador-deems-forests-to-be-living-entities> (last visited Mar. 8, 2020).

<sup>41</sup> See *Interactive Dialogues of the General Assembly*, UNITED NATIONS HARMONY WITH NATURE, <http://www.harmonywithnatureun.org/dialogues> (last visited Mar. 8, 2020).

have a clean and healthy environment free from pollution.<sup>42</sup> The resolution also establishes the Klamath River's right to "have a stable climate free from human-caused climate change impacts," building important precedent for nature's right to a stable climate.<sup>43</sup> The Yurok Tribe joined three other tribes in recognizing the Rights of Nature in law: the Ponca Nation (which passed a Rights of Nature law), the Ho-Chunk Nation (which is advancing a Rights of Nature amendment to its constitution), and the White Earth Band of Ojibwe (which recognized the legal rights of wild rice).<sup>44</sup>

Dozens of local governments in the United States and internationally, such as in Brazil,<sup>45</sup> have also recognized Rights of Nature, sometimes with reference to climate change action. Santa Monica's Sustainability Rights Ordinance recognizes that "[n]atural communities and ecosystems possess fundamental and inalienable rights to exist and flourish in the City of Santa Monica."<sup>46</sup> Concerning climate change, the Ordinance also recognizes the human right to a sustainable natural climate unaltered by fossil fuel emissions and establishes that the city's residents can bring actions to protect atmospheric systems and other natural entities.<sup>47</sup> The Rights of Nature in Santa Monica are implemented largely through its ambitious Sustainable City Plan.<sup>48</sup> Another example is the "climate bill of rights" in Lafayette, Colorado, which recognizes an ecosystem's right to a healthy climate<sup>49</sup> and has inspired other communities to pursue similar laws.

Together, these Rights of Nature constitutional amendments, treaty agreements, laws, ordinances, resolutions, and court decisions form a rising legal movement, one which has seen tremendous growth in the last fifteen years, with no signs of slowing down. As the global environmental emergency grows,

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<sup>42</sup> See *Yurok Nation Just Established Rights of the Klamath River*, CULTURAL SURVIVAL, <https://www.culturalsurvival.org/news/yurok-nation-just-established-rights-klamath-river> (last visited Mar. 8, 2020).

<sup>43</sup> See *infra* Sections V-IX.

<sup>44</sup> *Id.*

<sup>45</sup> See *Rights of Nature Law, Policy and Education*, U.N. HARMONY WITH NATURE, <http://www.harmonywithnatureun.org/rightsOfNature> (last visited Mar. 8, 2020).

<sup>46</sup> SANTA MONICA, CAL., ORDINANCE § 4.75.040(b) (2013) (ordinance establishing sustainability rights).

<sup>47</sup> *Id.* § 4.75.040(a)-(b).

<sup>48</sup> See CITY OF SANTA MONICA, SUSTAINABLE CITY PLAN (2003), <https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Sustainability/Sustainable-City-Plan.pdf>.

(last visited March 6, 2020).

<sup>49</sup> LAFAYETTE, COLO., CLIMATE BILL OF RIGHTS, ORDINANCE NO. 02 (2017).



governments are more willing to create and adopt environmental law based in the Rights of Nature and other ecocentric legal movements. Whether these reforms are enough to help solve the climate crisis and other environmental threats remains to be seen.

## V. THE HUMAN RIGHT TO A STABLE CLIMATE—IS NATURE NEXT?

Whereas only a few local governments have recognized nature’s right to a stable climate (or a “healthy” or “sustainable” climate), the effort to recognize the human right to a stable climate has entered the mainstream. Perhaps the best-known example is the case *Juliana v. United States*, dubbed by environmentalists as “the case of the century.”<sup>50</sup> The plaintiffs in *Juliana* include 21 young persons, ages 8 to 19; the nonprofit organization Earth Guardians; and “Future Generations” of humans, represented by appointed Guardian James Hansen, the former NASA scientist who has warned about climate change since the 1980s.<sup>51</sup>

In short, the plaintiffs in *Juliana* allege that the United States “permitted, encouraged, and otherwise enabled continued exploitation, production, and combustion of fossil fuels,” thereby allowing CO<sub>2</sub> levels to rise to dangerous levels.<sup>52</sup> The plaintiffs allege that these actions violate their right to a stable climate system, which is reserved by the Ninth Amendment and essential to the Fifth Amendment’s guarantee that the government shall not deprive any person of life, liberty, or property without due process of law.<sup>53</sup> The plaintiffs also allege that these actions violate the public trust doctrine.<sup>54</sup> In 2016, the U.S. District Court of Oregon denied the federal government’s motion to dismiss the case, allowing it to proceed to trial.<sup>55</sup> In 2020, the U.S. Ninth Circuit Court of Appeals dismissed the lawsuit, with the 2-1 majority ruling that the plaintiffs’ injuries were not redressable because complex climate change policy must come from the

<sup>50</sup> James Huffman, *9th Circuit Weighs ‘Climate Kids’ Lawsuit*, INSIDE SOURCES, June 11, 2019, available at <https://www.insidesources.com/9th-circuit-weighs-climate-kids-lawsuit> (last visited Mar. 8, 2020).

<sup>51</sup> 217 F. Supp.3d 1224 (D. Or. 2016).

<sup>52</sup> See First Amended Complaint for Declaratory and Injunctive Relief, *Juliana v. United States*, No.: 6:15-cv-01517-TC (D. Or. 2015).

<sup>53</sup> *Id.*

<sup>54</sup> *Id.*

<sup>55</sup> See *Juliana v. United States*, No. 18-36082 (9th Cir. 2019), available at <http://climatecasechart.com/case/juliana-v-united-states> (last visited Mar. 9, 2020). The plaintiffs have since filed a petition for a rehearing *en banc*. If granted, a panel of 11 judges would rehear the case. Petition for Rehearing *En Banc* of Plaintiffs-Appellees, *Juliana v. United States*, No. 18-36082 (9th Cir. 2020).

executive and legislative branches.<sup>56</sup> Despite being dismissed, *Juliana* helped inspire climate change lawsuits across the world, which now total over 1,400.

Where *Juliana* fell short, the *Urgenda* case in the Netherlands prevailed. In December 2019, in a case brought by the environmental group Urgenda, the Supreme Court of the Netherlands ordered the national government to slash greenhouse gas (GHG) emissions to 25% below 1990 levels by 2020, affirming the ruling of a lower Dutch court.<sup>57</sup> The failure of the Dutch State to reduce its emissions violated its duty to uphold the right to life (Article 2) and to private and family life (Article 8) as recognized by the European Convention for the Protection of Human Rights and Fundamental Freedoms.<sup>58</sup> In the decision, Chief Justice Kees Streefkerk wrote that "the lives, well being [sic] and living circumstances of many people around the world, including in the Netherlands, are being threatened" due to climate change.<sup>59</sup>

Similar to the argument that prevailed in *Juliana*, the Dutch government argued that climate change policy must come from the political branches of government, not the courts. The Supreme Court of the Netherlands disagreed, ruling that it could order a reduction in GHG emissions so long as the political branches of government decided upon the means to achieve this reduction.<sup>60</sup>

These groundbreaking climate change cases offer a glimmer of hope to supporters of strong climate change action. But turning back to the Rights of Nature, should *all* life on the planet, not just humans, possesses a fundamental right to a stable climate? Should coral reefs have a right to a stable climate where global warming of two degrees Celsius threatens to eradicate them? What about the death of over one billion animals in the climate-fueled wildfires in Australia in 2019-2020, some of which now have a greater risk of near-term extinction,<sup>61</sup> or

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<sup>56</sup> *Juliana v. United States*, No. 18-36082, at 25 (9th Cir. 2020). The plaintiffs filed a petition for *en banc* review, which has not been decided as of the time of publication.

<sup>57</sup> *A Moment of Hope: Urgenda Wins Historic Climate Case in Supreme Court of the Netherlands*, URGENDA, <https://news.smart.pr/urgenda/media-release-climate-case-nl> (last visited Mar. 9, 2020).

<sup>58</sup> *Urgenda Foundation v. Kingdom of the Netherlands*, Translation of Judgment, Dec. 20, 2019, available at <https://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:HR:2019:2007>.

<sup>59</sup> John Schwartz, *In 'Strongest' Climate Ruling Yet, Dutch Court Orders Leaders to Take Action*, N.Y. TIMES, Dec. 20, 2019, available at <https://www.nytimes.com/2019/12/20/climate/netherlands-climate-lawsuit.html> (last visited Mar. 9, 2020).

<sup>60</sup> *Urgenda Foundation*, *supra* note 58, at ¶ 2.2.3.

<sup>61</sup> Brigit Katz, *More Than One Billion Animals Have Been Killed in Australia's Wildfires, Scientist Estimates*, SMITHSONIAN MAGAZINE, Jan. 8, 2020, available at

the seventeen million acres of forests that have burned? Does all life not deserve a basic right to justice?

By and large, climate justice for nature remains largely aspirational because traditional Western legal systems define most life on our planet as human property or “things.” Under current legal systems, they have no rights. But, as Section IV demonstrates, anthropocentric laws are ceding ground to ecocentric laws, otherwise known as “Earth laws,” that seek to harmonize our legal system with nature’s basic needs, including the provision of legal rights to nature. If this trend continues, nature, along with humans, may be allowed to fight for its right to a stable climate in court.

## VI. THE RIGHTS OF NATURE: A TOOL TO ADDRESS CLIMATE CHANGE

### A. Rights of Nature v. Status Quo

The precedent summarized in Section IV highlights the growing use of the Rights of Nature as a tool to address climate change and other environmental harms. Understanding how nature’s right to a stable climate differs from the international community’s current approach to climate change is helpful in guiding future Rights of Nature practitioners.

While existing legal precedent connecting climate change to the Rights of Nature is limited, basic Rights of Nature principles can still be applied to the context of climate change. Therefore, to begin this exercise, consider some of the best practices of Rights of Nature laws.<sup>62</sup>

1. Nature is a “legal entity” or a “person” with fundamental rights that the government must uphold. Examples of nature’s rights include rights to exist, thrive, and restoration, amongst others.
2. Where these rights are infringed upon, nature should be entitled to full and prompt restoration.

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<https://www.smithsonianmag.com/smart-news/more-one-billion-animals-have-been-killed-australias-wildfires-scientist-estimates-180973926> (last visited Mar. 9, 2020).

<sup>62</sup> For more information, see, e.g., EARTH LAW CTR., COMMUNITY TOOLKIT FOR RIGHTS OF NATURE (2019), available at <https://bit.ly/39GDmWI> (last visited Mar. 9, 2020).

3. Nature must be given a voice in government, including, but not limited to, access to the courts, the right to participate in governmental decision-making, and the right to political representation.
4. To achieve the goals articulated in subpoint 3, nature is entitled to independent, qualified, and appropriate legal guardians that act solely and transparently on behalf of nature, its rights, and its interests. A legal guardian must be empowered to enforce and protect nature's rights, including taking appropriate legal action on its behalf. Note that some laws allow *anyone* to seek enforcement of the Rights of Nature.
5. The government must establish necessary governmental organs, authorities, functionaries, and financial mechanisms to ensure full enforcement of the Rights of Nature.

If the Rights of Nature were widely recognized and applied based upon these best practices, how would this impact the international climate change regime? Additionally, if nature's fundamental right to a stable climate was recognized, how would climate change solutions differ? While these questions remain unanswered, the following charts provide an initial framework.

**Climate Change Solutions:**  
 Status Quo v. The Rights of Nature

<b>1. Carbon Trading &amp; Right to Pollute</b>	
<p><b>Status Quo:</b> A widely accepted approach to mitigating climate change is through carbon markets, which maintain the “right to pollute” for those who can pay for carbon credits, particularly developed countries. Carbon markets have been shown to promote “business as usual” and are associated with corruption and human rights violations.</p>	<p><b>Rights of Nature:</b> There is no “right to pollute” carbon, including by developed countries - the primary historic contributors to climate change - who can afford carbon credits. All countries must make necessary reductions to their emissions, with developed nations providing significant financial support to help developing countries do so.</p>
<b>2. Limiting Temperature Increase</b>	
<p><b>Status Quo:</b> Countries have loose, incentive-based commitments to reduce greenhouse gas emissions with the goal of limiting temperature increases to 1.5 degrees or 2 degrees Celsius above preindustrial temperatures.</p>	<p><b>Rights of Nature:</b> Countries are legally bound to rapid decarbonization to achieve net-zero then net-negative emissions in the near future, limiting near-term temperature increases to well below 1.5 degrees Celsius above preindustrial levels and then fully stabilizing the climate system.</p>
<b>3. Ecosystem Representation</b>	
<p><b>Status Quo:</b> Ecosystems are represented in climate change negotiations and national lawmaking indirectly, through civil society groups and governmental agencies that may have mixed incentives to balance ecosystem needs against short-term economic gains. Nature has no direct voice in climate change talks. Indigenous leaders, who have strong moral and cultural standing to speak on behalf of nature, are often marginalized.</p>	<p><b>Rights of Nature:</b> Ecosystems have a “seat at the table,” both internationally during climate change negotiations as well as within domestic legal processes. “Nature” is directly represented in high-level climate change negotiations, including in all closed-door meetings, through independent legal guardians and its own delegation - some of whom must be Indigenous leaders. Nature may become an official party to climate change agreements if it wishes to do so.</p>

<b>4. Climate Change Solutions</b>	
<p><b>Status Quo:</b> Countries support many climate change solutions that fail to address root causes - e.g., geoengineering and other “techno-fixes,” a shift to natural gas and other dirty energy sources instead of 100% clean energy, carbon markets (see above), REDD+ (“Reducing Emissions from Deforestation and Forest Degradation” - a carbon offsetting regime opposed by many, including Indigenous peoples), and others.<sup>63</sup></p>	<p><b>Rights of Nature:</b> The global community commits to economic systems change by challenging overarching models of production and consumption, fully decarbonizing in the near-future, achieving zero conversion of natural forests and supporting community forest management, living well within all planetary boundaries, and empowering Indigenous communities to serve as stewards of all ancestral lands.</p>
<b>5. Rights of Nature Recognition and Implementation</b>	
<p><b>Status Quo:</b> Rights of Nature is recognized sporadically throughout the world with limited implementation in practice. It is not recognized in any climate change agreements.</p>	<p><b>Rights of Nature:</b> Rights of Nature is recognized globally and is legally enforceable as a fundamental right. Nature’s right to a stable climate in particular is recognized and put into practice through enforceable climate change action plans.</p>

By providing nature with a seat at the table and incorporating Rights of Nature concepts into the international response to climate change, a new paradigm emerges to help achieve a stable climate and countless other environmental benefits. Whether the political will exists to make these drastic changes remains to be seen, but at least giving nature a voice at climate change negotiations to express its needs is a valuable first step.

#### B. The Right to a Stable Climate: Rights of Nature v. Human Rights

Nature’s right to a stable climate is distinct from the same human right. However, recognizing the Rights of Nature is not in opposition to, nor in place of, human rights; it is merely an ecocentric approach that seeks the same goal: a thriving and healthy planet.

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<sup>63</sup> See, e.g., *False Solutions to Climate Change*, FRIENDS OF THE EARTH OF EUROPE, <https://www.foeeurope.org/false-solutions> (last visited Mar. 9, 2020).

While the over-arching goal of these movements may be identical, Rights of Nature presents distinct advantages to that of a wholly human right focused regime. One advantage is the consideration of the inherent worth of nature encourages the protections of ecosystems, plant and animal species, and other natural entities beyond their mere economic value to humans. Another advantage is the recognition that all species and ecosystems are interconnected, and that the continued well-being of humans necessitates the protection and restoration of the entire biosphere. Climate change law and policy based on an ecocentric perspective better addresses root causes with the goal of protecting all life - not only humans.

With that background in mind, consider the following summary comparison of nature’s right to a stable climate versus the human right to a stable climate.

**Climate Change Philosophies:**

Human Right to a Healthy Environment v. Nature’s Right to a Stable Climate

<b>1. Frame of Reference</b>	
<p><b><i>Human Right to a Stable Climate:</i></b> Anthropocentric perspective (i.e., human-focused). Considers the inherent value of humans.</p>	<p><b><i>Nature’s Right to a Stable Climate:</i></b> Ecocentric perspective (i.e., focused on the overarching well-being of all life). Considers the inherent value of both nature and humans.</p>
<b>2. Adaptation Goals</b>	
<p><b><i>Human Right to a Stable Climate:</i></b> Focuses on human adaptation - e.g., climate refugees, human migration, sea level rise impacts to coastal communities, food and water sources for humans, increased wildfire risk where humans live, etc.</p>	<p><b><i>Nature’s Right to a Stable Climate:</i></b> Focuses on ecosystem adaptation - enhancing habitat connectivity (e.g., wildlife corridors that connect fragmented habitat), supporting ecosystem resilience, storm buffering coastal wetlands, etc.</p>
<b>3. Connection with Rights-Based Movements</b>	
<p><b><i>Human Right to a Stable Climate:</i></b> Ties into the larger human rights movement; emphasizes social justice, environmental justice, etc.</p>	<p><b><i>Nature’s Right to a Stable Climate:</i></b> Ties into the larger Rights of Nature movement (while still considering human well-being since humans are part of nature); places an emphasis on justice for all life.</p>

Many Rights of Nature laws and court decisions also recognize human environmental rights and Indigenous rights with the understanding that these movements support each other. Consider the Colombian Supreme Court case in Section IV, which recognized both the rights of the Amazon as well as the human right to a healthy environment.

## VII. A BLUEPRINT FOR ACTION

If a government, international organization, or other entity supports new legal and economic paradigms based upon the Rights of Nature, including the belief that nature has a right to a stable climate, it may be unclear how to manifest this support into tangible action. This section summarizes some of the possible approaches for recognizing and implementing nature's right to a stable climate.

Consider the following strategies that a nation might take to recognize and implement nature's right to a stable climate:

1. Pass a constitutional amendment, national law, declaration, or other legal instrument recognizing the Rights of Nature, including but not limited to nature's right to a stable climate. Such legal instruments could call upon other nations and international bodies to respect these universal rights, including during climate change negotiations.
2. Seek direct integration of the Rights of Nature into climate change negotiations, by ensuring direct representation of nature via a delegation of select legal guardians and experts and by proposing specific text that recognizes and upholds nature's right to a stable climate. This right can then be implemented through specific state obligations.
3. Integrate Rights of Nature concepts into current and future environmental laws, programs, and initiatives at the national level. For example, recognize coral reefs as subjects of rights through amendments to existing coral protection laws<sup>64</sup> and also ratchet up coral reef protections

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<sup>64</sup> See, e.g., *Coral Reefs*, EARTH LAW CTR., <https://www.earthlawcenter.org/coral-reefs-initiative> (last visited Mar. 9, 2020).



- particularly those related to climate change, ocean acidification, and the like. A similar model could be implemented for forest protection laws, wildlife laws, river protection laws, climate change laws, and others.

4. Establish a robust and independent legal guardianship body at the national level to advocate for integration of nature's rights into all aspects of governance and society.
5. Upon recognizing nature's right to a stable climate, seek justice internationally and pursue landmark Rights of Nature decisions through the courts (such as the International Court of Justice).

#### **VIII. ISLAND NATIONS: THE FLAG-BEARERS OF A GLOBAL MOVEMENT?**

Along with other disproportionately impacted groups, such as Indigenous peoples, island nations have strong ethical standing to call for the recognition and implementation of nature's right to a stable climate. While they contribute less than one percent of global greenhouse gas emissions, island nations and the surrounding marine ecosystems experience a disproportionate amount of harm from climate change. These harms include, but certainly are not limited to, the loss of land caused by rising sea levels, salinization of freshwater sources, loss of endemic species, and damage to coral reefs due to ocean warming and acidification.

Island nations have also long been leaders of cutting-edge environmental movements. Palau was the first country in the world to designate its national waters as a shark sanctuary<sup>65</sup> and to ban sun cream that damages coral reefs and other marine life.<sup>66</sup> In 2019, the Pacific island of Vanuatu called for ecocide to be considered a crime at the International Criminal Court in the Hague.<sup>67</sup> And related

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<sup>65</sup> *Shark Sanctuaries Around the World*, THE PEW CHARITABLE TRUSTS, <https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2016/03/shark-sanctuaries-around-the-world> (last visited Mar. 9, 2020).

<sup>66</sup> *Palau is First Country to Ban 'Reef Toxic' Sun Cream*, BBC NEWS, <https://www.bbc.com/news/world-asia-50963080> (last visited Mar. 9, 2020).

<sup>67</sup> *Vulnerable Nations Call for Ecocide to Be Recognized as an International Crime*, CLIMATE LIABILITY NEWS, <https://www.climateliabilitynews.org/2019/12/06/ecocide-international-criminal-court-vanuatu/> (last visited Mar. 9, 2020).

to climate change, it was largely due to the vocal demands of island nations, such as through the Alliance of Small Island States (AOSIS), that a limit to global temperature increases of “well-below” 1.5 degrees Celsius above preindustrial levels became an alternative to the traditional 2 degrees Celsius threshold.<sup>68</sup> While these are only a few examples, they show the willingness of island nations to implement bold, new legal approaches that get to the root of environmental challenges.

Numerous organizations and environmental experts are available to advise countries, island nations or otherwise, that wish to integrate Rights of Nature into their governance. For example, the nonprofit organization Earth Law Center<sup>69</sup> has a campaign to seek recognition of nature’s rights to a stable climate and offers pro bono legal assistance to interested governments and civil society organizations.<sup>70</sup> Many other Rights of Nature organizations and experts are listed on the United Nations Harmony with Nature Initiative’s Knowledge Network Experts website.<sup>71</sup> Through new global partnerships, perhaps island nations will be the flag-bearers of a global movement to recognize that nature has a right to a stable climate.

## IX. CONCLUSION

Climate change has already caused drastic negative impacts to nature. However, solving the climate crisis is still possible: if we can reach and sustain net-zero carbon dioxide emissions, anthropogenic global warming could be stopped on a multi-decadal time scale. But significant changes to the current passive approach of nations are necessary.

Establishing Rights of Nature would help solve climate change, incorporating an underutilized approach into the international regime. Extending beyond its legal implications, many Rights of Nature advocates believe it will spur a social revolution in which living in harmony with nature becomes the cultural norm. As with most rights-based movements, recognition of rights influences cultural shifts and vice versa. The Rights of Nature, together with other

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<sup>68</sup> Monica Bjermeland, *The Story of 1.5°C*, CTR. FOR INT’L CLIMATE RESEARCH, <https://cicero.oslo.no/en/understanding-one-point-five/the-story-of-15> (last visited Jan. 5, 2020).

<sup>69</sup> Disclaimer: The author of this article is the Executive Director & Directing Attorney of Earth Law Center.

<sup>70</sup> *Island Nations*, EARTH LAW CTR., <https://www.earthlawcenter.org/island-nations> (last visited Mar. 9, 2020).

<sup>71</sup> See *Knowledge Network Experts*, UNITED NATIONS HARMONY WITH NATURE, <http://www.harmonywithnatureun.org/experts> (last visited Mar. 9, 2020).

Earth law movements, can form the blueprint of a new generation of laws, economic activities, and societal norms.

Finally, because island nations are more vulnerable to the risks of climate change and have a long history of being on the forefront of cutting-edge environmental movements, they are strong candidates to be the flag-bearers of the movement to recognize nature's right to a stable climate. By giving nature legal rights, island nations and other countries advocating for stronger climate action will also have additional tools and leverage during climate change negotiations. Ultimately, when it comes time for the next climate change conference, ask yourself: what would nature want?

**HISTORIC PRESERVATION IN THE CITY OF BEAUFORT, SOUTH CAROLINA:  
CONSIDERATIONS FOR RESILIENCE**

Danielle Goshen<sup>1</sup>

**I. INTRODUCTION: BEAUFORT, A HISTORIC “BEST SMALL TOWN” AT RISK**

The city of Beaufort, South Carolina is located on Port Royal Island, and is the state’s second oldest city. In 1711, the British founded Beaufort and the city was established as a shipbuilding center, before it became an agricultural hub during the antebellum period. During the Civil War, Beaufort was quickly occupied by the Union forces, and became an important terminus for previously enslaved people as they escaped plantations of the Confederacy. While the city has an estimated population of over 13,000,<sup>2</sup> around 192,500 tourists visit Beaufort each year to soak in its rich history and enjoy the charming seaside scenery.<sup>3</sup> In

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<sup>1</sup> Danielle Goshen, J.D., graduated from the University of Georgia School of Law in 2019. During her time at Georgia Law she has served as a Georgia Sea Grant Legal Fellow, an Editorial Board Member for the *Journal of Intellectual Property Law*, and as the President of the Environmental Law Association. Danielle also interned at the Environmental Protection Agency’s Region 4 office in Atlanta in the summer of 2018. This paper is one outcome of a four-state regional project funded by the National Oceanic Atmospheric Administration (NOAA), Florida Sea Grant, Georgia Sea Grant, South Carolina Sea Grant, and North Carolina Sea Grant, Project No.: FY2014-2018: NA14OAR4170084. Special thanks goes to Rebecca Neubauer, Law Student, University of North Carolina School of Law & North Carolina Sea Grant and Heather Payne, Associate Professor at Seton Hall School of Law, who provided background on national historic preservation laws in their paper: “Historical Preservation Laws and Long-Term Climate Change Adaptation: Challenges and Opportunities.” Additional thanks goes to Shana Jones, J.D., Director of the Georgia Sea Grant Law Program, for providing essential editing support, as well as overall direction for the project, Sarah Watson, Coastal Climate and Resilience Specialist, South Carolina Sea Grant and Carolinas Integrated Sciences and Assessments, and Professor Kirstin Dow, Carolina Trustees Professor in the Department of Geography at the University of South Carolina, for providing important feedback on this project.

<sup>2</sup> *Quick Facts Beaufort City, South Carolina*, U.S. CENSUS BUREAU, <https://www.census.gov/quickfacts/fact/table/beaufortcitysouthcarolina> (last visited July 25, 2019).

<sup>3</sup> WOOD ENV’T & INFRASTRUCTURE SOLUTIONS, CITY OF BEAUFORT, SC: PROGRAM FOR PUBLIC INFORMATION 17 (August 2018), [https://www.cityofbeaufort.org/AgendaCenter/ViewFile/Agenda/\\_09182018-432](https://www.cityofbeaufort.org/AgendaCenter/ViewFile/Agenda/_09182018-432) (last visited July 25, 2019).

2017, Beaufort received the South's "Best Small Town" award by *Southern Living Magazine*.<sup>4</sup>

While Beaufort's proximity to the coast makes for a beautiful setting, it comes with challenges. Beaufort is especially vulnerable to stormwater and tidal flooding due to its location and low elevation. While all of Beaufort experiences inadequate drainage due to tidal influences, three of the city's five historic neighborhoods (The Point, Northwest Quadrant, and Old Commons) have been recognized as stormwater flooding problem areas.<sup>5</sup> Unfortunately, these historic downtown areas also represent Beaufort's main tourism hubs, and play a key role in the success of Beaufort's economy.<sup>6</sup> Further, the continuing effects of sea level rise will only compound stormwater and tidal flooding in the future.<sup>7</sup> The combination of elements means that the future of Beaufort's historic properties and tourism industry are in jeopardy due to flooding.

In light of these risks, projects that help adapt Beaufort to increased flooding must be assessed. An evaluation of adaptation projects must be done not just on the large (e.g., construction of bulkheads and seawalls and improving stormwater management systems) and neighborhood-scale (i.e., properly maintaining catch basin inlets), but also on the household-scale (i.e., building retrofits and structure elevation). Importantly, these household-scale changes may provide homeowners with a crucial opportunity to protect their property now, while neighborhood and large-scale projects take time to gain support and funding.

Homeowners of historic structures face added difficulties compared to other homeowners when deciding whether and how to adapt their home to increased flooding risks. Due to the cultural significance of historic properties, federal, state, and local governments incentivize preservation efforts and regulate what adaptation techniques are available to homeowners. Because household-scale changes are essential to protect historic properties and the future of the tourism industry in Beaufort, this article seeks to understand how federal and state incentive programs and local government regulatory schemes impact historic preservation efforts.

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<sup>4</sup> Cassandra Kink, *The South's Best Small Town 2017: Beaufort South Carolina*, SOUTHERN LIVING (2017), <https://www.southernliving.com/souths-best/beaufort-south-carolina> (last visited July 25, 2019).

<sup>5</sup> WOOD ENV'T & INFRASTRUCTURE SOLUTIONS, *supra* note 3, at 8.

<sup>6</sup> *Id.*

<sup>7</sup> *Id.* at 6.

To do so, this article will first review federal recognition of Beaufort's historic assets. Second, it will describe federal and state incentives (i.e., grants, tax credits, and tax assessments) aimed at preserving historic resources. Crucially, while homeowners may be required to undergo adaptation projects with the "least impact on the historic character of the building, its site, and setting" in order to be eligible for federal and state incentives, they may still undertake even substantial measures when necessary to protect the historic site, as in the case of flooding.<sup>8</sup> Third, this article will examine how Beaufort preserves its historic assets through local zoning and planning ordinances. This section will emphasize that Beaufort's Historic District Review Board (HRB) has broad discretion to approve preservation projects for historic houses by issuing "certificates of appropriateness." Further, this section will highlight how the HRB can actively promote adaptation to increased flood damage through stabilization of homes determined to be "demolished by neglect." Fourth, this article will examine how the city's local flood damage prevention ordinances, which are required under the National Flood Insurance Program (NFIP), aim to protect all structures at special risk against flood damage. This section will show how Beaufort's Zoning Board of Appeals (ZBOA) can promote preservation through carefully considering which historic houses are eligible for variances from these ordinances. Lastly, this article will take a brief look at how Annapolis, Maryland has used a "resilience guide" to promote historic preservation. Such documents can provide homeowners and local governments with essential guidance on how to safeguard historic properties against damage from flooding.

## II. FEDERAL RECOGNITION OF HISTORIC BEAUFORT

The historic significance of Beaufort is reflected in the number of sites listed on the National Register. The National Register, established by the National Historic Preservation Act (NHPA), is a list of properties and sites prioritized by the federal government for preservation. To qualify for listing on the National Register, a property must meet the National Register Criteria for Evaluation, set forth by the National Park Service (NPS).<sup>9</sup>

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<sup>8</sup> TECHNICAL PRES. SERV., NAT'L PARK SERV., U.S. DEP'T OF THE INTERIOR, THE SECRETARY OF THE INTERIOR'S STANDARDS FOR THE TREATMENT OF HISTORIC PROPERTIES WITH GUIDELINES FOR PRESERVING, REHABILITATION, RESTORING & RECONSTRUCTING HISTORIC BUILDINGS 153 (2017), <https://www.nps.gov/tps/standards/treatment-guidelines-2017.pdf> (last visited July 25, 2019) [hereinafter STANDARDS].

<sup>9</sup> 36 C.F.R. § 60.4.

Renowned for its preserved antebellum architecture, 304 acres of Beaufort's downtown were designated a National Historic Landmark (NHL) in 1973.<sup>10</sup> In 2000, when the last survey was done, over 470 structures were listed as "contributing resources"<sup>11</sup> in this area.<sup>12</sup> The Secretary of Interior has determined the city's NHL district "to be nationally significant in American History and Culture."<sup>13</sup> The NHL district contains five distinct neighborhoods, each reflecting a unique style and character.<sup>14</sup> These neighborhoods include: the District, the Point, the Old Commons, the Bluff, and the Northwest Quadrant.<sup>15</sup> The various historic homes, churches, commercial buildings, and gardens reflect the federal, neoclassical, and Greek revival styles. The Northwest Quadrant has been the center of Beaufort's African-American population, and its historic structures generally reflect "shotgun" style architecture.<sup>16</sup>

Additionally, within the historic district there are seven sites that are individually listed on the National Register.<sup>17</sup> Outside of the NHL, the city is home to fourteen other locations individually listed on the National Register. These sites include the Beaufort National Cemetery, Fort Lyttelton, Huntington Island State Park Lighthouse, Seaside and Laurel Bay plantations, the Seacoast Packing Company building, and seven historic houses.

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<sup>10</sup> *Historic District*, CITY OF BEAUFORT, S.C., <http://www.cityofbeaufort.org/178/Historic-District> (last visited July 25, 2019).

<sup>11</sup> A contributing resource is defined as a "building, site, structure, or object adding to the historic significance of a property." NATIONAL PARK SERVICE, HOW TO COMPLETE THE NATIONAL REGISTER REGISTRATION FORM- APPENDIX IV, GLOSSARY OF NATIONAL REGISTER TERMS, [https://www.nps.gov/nr/publications/bulletins/nrb16a/nrb16a\\_appendix\\_IV.htm](https://www.nps.gov/nr/publications/bulletins/nrb16a/nrb16a_appendix_IV.htm) (last visited July 25, 2019).

<sup>12</sup> NAT'L PARK SERV., NATIONAL REGISTER OF HISTORIC PLACES, LIST OF CONTRIBUTING RESOURCES, BEAUFORT HISTORIC DISTRICT (updated Aug. 2000), <https://www.cityofbeaufort.org/DocumentCenter/View/948/National-Register-of-Historic-Places-Continuation-Sheet-Section-7-Page-14?bidId> (last visited July 25, 2019).

<sup>13</sup> *Frequently Asked Questions*, NAT'L PARK SERV., <https://www.nps.gov/subjects/nationalhistoriclandmarks/faqs.htm> (last visited July 25, 2019).

<sup>14</sup> Terminology here is important. Beaufort's "National Historic Landmark" district is the federally recognized historic district in Beaufort that was designated in 1973, whereas the "Beaufort Historic District" is Beaufort's locally designated historic district.

<sup>15</sup> *Map of Contributing Structures*, CITY OF BEAUFORT, <https://sc-beaufort.civicplus.com/DocumentCenter/View/4027/Contributing-Structures-?bidId> (last visited July 25, 2019) (map taken from the 2008 Historic Preservation Plan).

<sup>16</sup> "Shotgun" houses are narrow rectangular homes that were popular in the post-Civil War south. Their architectural style reflects Haitian and African roots.

<sup>17</sup> Sites that are individually listed on the National Register include: The Anchorage, William Barnwell House, John A. Cuthbert House, Marshlands, Robert Smalls House, Tabby Manse, and John Mark Verdier House.

### III. FEDERAL AND STATE INCENTIVES FOR PRESERVING HISTORIC STRUCTURES IN BEAUFORT

Once a property is listed on the National Register, the NHPA does not place any restrictions on the actions of private owners of historic properties.<sup>18</sup> However, as properties face wear and tear, homeowners will likely want to repair and restore the property in order to maintain the physical integrity of the historic structures. Federal and state governments provide incentives to motivate owners of historic properties to undergo these (often costly) repairs and restorations. If a homeowner wants to receive these incentives he must comply with federal and state requirements. The federal and state incentive regimes are discussed below.

#### A. Federal Grants and Tax Credits for Depreciable Buildings

To facilitate proper maintenance of historic structures, all individually listed sites and sites within the historic district that are found to be a contributing resource are eligible for federal grants under the Historic Preservation Fund (HPF). HPF grants were established by the NHPA in 1977 and are administered by the NPS on behalf of the Secretary of the Interior.<sup>19</sup> While this fund goes to some “non-construction” activities such as surveying, inventorying, and planning for historic properties, it can also be used to stabilize, preserve, rehabilitate, or restore eligible properties listed on the National Register.<sup>20</sup> The funds are distributed according to a state or local government’s needs.<sup>21</sup>

Further, property owners of listed or contributing sources are eligible for up to a 20% tax credit on the total cost of a certified rehabilitation project on a depreciable building.<sup>22</sup> A building is depreciable if it is “used in a trade or business or held for the production of income. . . and may not serve exclusively as the owner’s private residence.”<sup>23</sup>

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<sup>18</sup> 54 U.S.C. § 100101.

<sup>19</sup> NAT’L PARK SERV., THE HISTORIC PRESERVATION FUND ANNUAL REPORT (2016), <https://www.nps.gov/shpo/downloads/2016HPFReportweb.pdf> (last visited Mar. 3, 2019).

<sup>20</sup> *Id.*

<sup>21</sup> *Id.*

<sup>22</sup> NAT’L PARK SERV., HISTORIC PRESERVATION TAX INCENTIVES 3 (2012), <https://www.nps.gov/TPS/tax-incentives/taxdocs/about-tax-incentives-2012.pdf> (last visited Aug. 7, 2019).

<sup>23</sup> *Id.* at 9.



To tap into these federal tax credits and grants, a property owner must follow the Secretary of the Interior's Standards for The Treatment of Historic Properties (Standards).<sup>24</sup> The Standards are codified in the National Register and address four specific "treatments" available to owners of properties listed on the National Register, including Preservation, Rehabilitation, Restoration, and Reconstruction.<sup>25</sup> The Standards set forth the appropriate building materials, external features, and internal structures that a historic property must conform to in order to retain its historical designation.<sup>26</sup>

When property owners undergo one of these four treatments with federal grant money or with hopes of obtaining a federal tax credit, they must certify with the NPS and State Historic Preservation Office (SHPO) that their project is consistent with the Standards for Rehabilitation.<sup>27</sup> Non-conformance with a code section, or poorly executed attempts at compliance can lead to a de-listing if the property has "ceased to meet the criteria for listing in the National Register because the qualities which caused it to be originally listed have been lost or destroyed."<sup>28</sup> Removal from the National Register results in ultimate loss of eligibility for federal incentives.

#### B. State Tax Credits for Historic Structures: "Owner-Occupiers" Get a Bite of the Carrot, Too!

In addition to the federal incentives, South Carolina provides two tax credits for historic rehabilitation projects, which are available to more property owners than the federal tax credits.<sup>29</sup> To be eligible for South Carolina's tax credits, the property must already be listed or eligible for placement on the National Register.<sup>30</sup> In South Carolina, one tax credit is available to private residential properties, meaning that they do not have to be depreciable, unlike the federal tax credit. Such "owner-occupied" properties are eligible for the 25% tax credit under the State Historic Rehabilitation Tax Credit.<sup>31</sup> Meanwhile, for

<sup>24</sup> STANDARDS, *supra* note 8.

<sup>25</sup> 36 C.F.R. § 68.

<sup>26</sup> STANDARDS, *supra* note 8.

<sup>27</sup> *See Tax Incentives for Preserving Historic Properties*, NAT'L PARK SERV., <https://www.nps.gov/tps/tax-incentives.htm> (last visited Aug. 7, 2019).

<sup>28</sup> 36 C.F.R. § 60.15.

<sup>29</sup> S.C. ARCHIVES & HISTORY CTR., PRESERVATION HOTLINE #11, [https://scdah.sc.gov/sites/default/files/Documents/Historic%20Preservation%20\(SHPO\)/Programs/Programs/Tax%20Incentives/preservation%20hotline%2011.pdf](https://scdah.sc.gov/sites/default/files/Documents/Historic%20Preservation%20(SHPO)/Programs/Programs/Tax%20Incentives/preservation%20hotline%2011.pdf) (last visited Aug. 7, 2019).

<sup>30</sup> *Id.*

<sup>31</sup> *Id.*

income-producing (depreciable) historic buildings, property owners may receive a 10% tax credit.<sup>32</sup> Further, mixed-use historic buildings (e.g., the first floor of a building is used for a store and the second floor is allocated for an owner-occupied residence) can also receive partial state tax credits under both the 10% and 25% State Historic Rehabilitation Tax Credit.<sup>33</sup>

In South Carolina, property owners that are eligible for the 20% Federal Historic Rehabilitation Tax Credit automatically qualify for the 10% State Historic Rehabilitation Tax Credit.<sup>34</sup> This tax credit is equal to 10% of rehabilitation costs.<sup>35</sup> However, owner-occupied historic residences that are not income-producing are eligible for the 25% State Historic Rehabilitation Tax Credit – which can be used towards all allowable rehabilitation expenses.<sup>36</sup> In order to be eligible for this credit, the project must be certified by the SHPO, which requires that all of the Standards discussed above will be met.<sup>37</sup>

### C. Local Tax Assessments for Historic Structures under the Bailey Bill

Finally, South Carolina's Bailey Bill allows local governments to assess properties on the pre-rehabilitation fair market value, for up to twenty years, as set by the special assessment period by the local government.<sup>38</sup> To be eligible for local tax assessment, the local government must adopt an ordinance to implement this program.

Beaufort adopted a Bailey Bill ordinance in 2014.<sup>39</sup> In Beaufort, if an eligible property owner invests 75% or more of the building's assessed value into the building, then the property value will be assessed at the pre-rehabilitation

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<sup>32</sup> *Id.*

<sup>33</sup> *Id.*

<sup>34</sup> *Id.*

<sup>35</sup> S.C. CODE ANN. § 12-6-3535.

<sup>36</sup> Allowable expenses include: exterior rehabilitation work; repair of historic structural systems; improving energy efficiency; repairs and installation of heating, air-conditioning, plumbing, and electrical systems; restoration of historic plaster; and architectural and engineering fees. *Id.*

<sup>37</sup> *Id.*

<sup>38</sup> *Id.* § 4-9-195 and § 5-21-140; S.C. ARCHIVES & HISTORY CTR., *supra* note 29.

<sup>39</sup> *Bailey Bill*, CITY OF BEAUFORT, S.C., <https://www.cityofbeaufort.org/348/Bailey-Bill> (last visited Aug. 7, 2019).

value for ten years.<sup>40</sup> Eligible property owners can count “costs necessary to maintain the historic character or integrity of the building” towards the expenditures for rehabilitation.<sup>41</sup> Structures that qualify must either be located in the historic district and are at least 50 years old, or listed on the 1997 Beaufort County Above Ground Historic Sites Survey.<sup>42</sup> Therefore, while some properties eligible for tax assessment under the Bailey Bill may not be eligible for listing on the National Register (i.e., if located within the historic district and is at least fifty years old but is not a contributing resource), most eligible recipients will be listed or eligible for listing on the National Register.

D. Substantial but Proportional Preservation Measures Are Available to Homeowners under the Standards

Because federal, state, and most local incentives depend on adherence to the Standards, property owners must be careful to follow its requirements. For example, if a property owner of a historic structure fails to adhere to the Standard’s requirements during a rehabilitation project, the property will risk de-listing from the federal register. As noted above, de-listing results in ineligibility for federal and state grants, tax credits, and some tax assessments. Therefore, it is essential for homeowners of historic properties to understand what they can do to protect their property from flood damage while continuing to adhere to federal regulations.

Fortunately, the Standards recognize that resilience to natural hazards is an important component of rehabilitation.<sup>43</sup> While the Standards require that any new adaptive treatments must produce the “least impact on the historic character of the building, its site, and setting,”<sup>44</sup> the Standards allow even substantial measures, such as raising historic buildings, when necessary to protect the site in certain situations such as flooding. Such measures to protect against flooding will only be

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<sup>40</sup> CITY OF BEAUFORT, DEP’T OF PLANNING AND DEV. SERV., THE BAILEY BILL PROGRAM (2015), <https://www.cityofbeaufort.org/DocumentCenter/View/3920/Complete-Bailey-Bill-Information-Packet> (last visited Aug. 7, 2019).

<sup>41</sup> S.C. CODE ANN. REGS. 12-120(D).

<sup>42</sup> *Id.* The purpose of the 1997 Beaufort County Above Ground Historic Sites Survey was to identify all historic resources that are eligible for listing on the National Register. BROCKINGTON AND ASSOCIATES, INC., BEAUFORT COUNTY ABOVE GROUND HISTORIC RESOURCE SURVEY, BEAUFORT COUNTY, SOUTH CAROLINA (1998), <http://nationalregister.sc.gov/SurveyReports/BeaufortCounty1998SM.pdf> (last visited Aug. 7, 2019).

<sup>43</sup> STANDARDS, *supra* note 8, at 24.

<sup>44</sup> *Id.* at 153.

appropriate if the historic character of the building is retained after the project is completed.<sup>45</sup> Adaptation measures may be implemented using special exemptions and variances from the Standards for treatments that protect against known hazards that would negatively affect the historic character of the site.<sup>46</sup>

#### IV. LOCAL PRESERVATION DECISIONS IN BEAUFORT: GOVERNING HISTORIC PRESERVATION THROUGH ORDINANCES

In addition to the federal and state incentive-based approaches to preservation, local governments may enact legally binding ordinances to preserve historic properties within their jurisdictions. Unlike federal and state incentives, local ordinances can place *affirmative duties* on property owners to maintain and preserve their homes in accordance with local policies, regardless of whether the property owner wishes to benefit from federal or state tax incentives. The NHPA's Certified Local Government (CLG) program recognizes this extraordinary power of local governments to preserve historic resources and helps local governments in developing local ordinances to protect its historic resources. Beaufort is a CLG under the NHPA, and therefore receives funding, technical assistance, and training from the South Carolina SHPO to develop its preservation plan.<sup>47</sup> The following section discusses the local zoning ordinances developed by Beaufort that place affirmative duties on owners to maintain and preserve historic properties.

##### A. HRB's Ability to Promote Historic Preservation under the Beaufort Code

Beaufort's zoning ordinances are codified under Chapter 6, Section 5-6001 of the Beaufort Code of Ordinances. This chapter adopts by reference the Beaufort Code (Code), which governs all parcels of land within the corporate limits of Beaufort that are not exempt under state or federal law.<sup>48</sup> The Code regulates all "construction, erection, alteration and movement" of "lands or

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<sup>45</sup> *Id.* at 154.

<sup>46</sup> *Id.* at 154-55. When appropriate, the Standards recommend elevating buildings to protect against flood damage only if the building will retain its historic character, such as by elevating it to a lesser degree to minimize the impact on the historic character of the property.

<sup>47</sup> S.C. DEP'T OF ARCHIVES & HISTORY, CERTIFIED LOCAL GOVERNMENTS OF SOUTH CAROLINA (2018),

[https://shpo.sc.gov/sites/default/files/Documents/Historic%20Preservation%20\(SHPO\)/Programs/Local%20Government/CLGs.pdf](https://shpo.sc.gov/sites/default/files/Documents/Historic%20Preservation%20(SHPO)/Programs/Local%20Government/CLGs.pdf) (last visited Mar. 3, 2019).

<sup>48</sup> Beaufort Code § 1.3.1.

structures” within its jurisdiction.<sup>49</sup> Where the Code imposes stricter standards than provisions of other statutes, local ordinances, or regulations, its provisions must be followed.<sup>50</sup>

Beaufort has designated the same 304 acres that constitutes the NHL as the “Beaufort Historic District,” with few exceptions.<sup>51</sup> The Code states that the purpose of this district is to:

promote the educational, cultural, and general welfare of the public through the preservation, protection, and enhancement of the old, historic or architecturally significant structures and areas of the City and to maintain such structures and areas as visible reminders of the history and cultural heritage of the City, the state, and the nation.<sup>52</sup>

Projects involving structures within the Beaufort Historic District are subject to review by the Historic District Review Board (HRB).<sup>53</sup> The HRB also has jurisdiction over the following areas: structures listed in the Beaufort County Historic Sites Survey of 1997 (or any more recent survey); and structures that apply for the Special Property Tax Assessment for Rehabilitated Historic Properties (a.k.a. Bailey Bill, discussed above), but are located outside the Beaufort Historic District.<sup>54</sup> Once the HRB approves of a planned project by issuing a Certificate of Appropriateness and before a property owner commences work on a historic property, the applicant must obtain a Project Permit from the City Manager or his or her appointee.<sup>55</sup>

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<sup>49</sup> *Id.*

<sup>50</sup> *Id.* at § 1.3.3.

<sup>51</sup> *Id.* at § 2.7.1.C. These exceptions include: (1) “Where boundaries are designated at specific roads, the centerlines of the rights-of-way of those roads shall be deemed said boundaries”; (2) The east and south boundaries of the district are established at the Beaufort River. These boundaries are established at the parcel lines, seawalls, or at mean high water mark, whichever extends further from the high ground”; and (3) “Structures attached to the high ground are deemed to lie within the district.” *Id.*

<sup>52</sup> *Id.* at § 2.7.1.

<sup>53</sup> *Id.* at § 10.7.

<sup>54</sup> *Id.* at § 10.7.2.A.

<sup>55</sup> *Id.* at § 9.5 and § 9.10. After a Certificate of Appropriateness has been obtained, an applicant must obtain a Project Permit. Project Permits are “required for any building, structure, or attachment to a structure to be erected, moved, added to, or structurally altered.” *Id.* at § 9.5.1. The Code does not provide much guidance on the city manager’s (or anyone designated by the city manager) decision making process when determining whether to grant or deny a Project Permit. However, any changes to a project proposal for a historic property made *after* the Certificate of

The following subsections discuss the HRB's project approval process through approving Certificates of Appropriateness and the HRB's ability to promote preservation through the stabilization of historic structures that are threatened with destruction.

*i. Certificate of Appropriateness: Special Approval for Projects Affecting Historic Structures*

The main responsibilities of the HRB are to "review and take action on any Major Certifications of Appropriateness," and to approve alterations on historic sites.<sup>56</sup> All "major" projects under the HRB's jurisdiction must obtain a Certificate of Appropriateness.<sup>57</sup> The Code uses an exclusionary definition to define "major projects," which is considered to be all projects that are not deemed "minor." Minor projects are ones that include:

- a. Changes to a building or property, to include fences, paint color, roof materials, canopies and awnings, site changes, and window replacements on noncontributing structures
- b. New construction and building modifications to include construction of non-habitable accessory buildings in the Beaufort Preservation Neighborhood
- c. Modifications to non-contributing structures in the BCN [Beaufort Conservation Neighborhood]
- d. Demolitions of non-contributing structures in the BCN
- e. Demolition or partial demolition of a structure that is listed in the "1997 Beaufort County Historic Sites Survey," or the most recent historic sites survey, and lies outside the Beaufort Historic District
- f. Demolition of noncontributing accessory structures (e.g., sheds, carports, etc.).<sup>58</sup>

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Appropriateness is approved, shall not be approved by the Administrator without specific approval of these changes by the city manager. If the city manager denies issuance of a Project Permit without being reviewed by the Building Codes Department, an applicant may appeal to the Zoning Board of Appeals (ZBOA) within 30 days of the Administrator's decision. *Id.* at § 9.5.2.

<sup>56</sup> *Id.* at § 10.7.2.B.

<sup>57</sup> *Id.* at § 9.10.2.

<sup>58</sup> *Id.*

Ordinary maintenance and repair of existing features that “does not involve a change in design, type of materials, or outward appearance” are exempt from obtaining a Certificate of Appropriateness.<sup>59</sup> Further, property owners may request a variance from the Code, if strict enforcement of standards would “result in unnecessary hardship to the applicant and...the spirit of the [Code] will be observed, public welfare and safety will not be diminished and substantial justice done.”<sup>60</sup> The ability to obtain a variance allows property owners the flexibility to undergo adaptation projects to help reduce risk of flood damage, such as elevation or other flood-proofing measures.

When a historic property owner submits a Certificate of Appropriateness, the HRB will first undergo a “completeness review.” Completeness review ensures all sections of the project proposal were filled out and all relevant documents were submitted. Once an application passes completeness review, it will move on to the “compliance review & report” stage.

Once the completeness review and compliance review and report stage are finished, the application gets sent to the HRB to rule on a certificate of appropriateness. During this stage, the HRB may approve, approve with conditions, or deny an applicant’s Certificate of Appropriateness. The HRB may require the applicant to make modifications to the project application and re-submit the application.

Before the HRB decides on a Certificate of Appropriateness, the HRB has a duty to conduct a public meeting and consider elements such as the nature and character of the surrounding area, use of the structure and its importance to the city, and appropriateness of design, among other factors.<sup>61</sup> During this stage, the HRB is prohibited from considering interior arrangement or interior design, unless it affects the exterior appearance.<sup>62</sup>

The HRB is also prohibited from making requirements that do not prevent “developments that are not in harmony with the prevailing character of the Beaufort Historic District, or that are obviously incongruous with this character.”<sup>63</sup> The Code notes that the HRB may deny a Certificate of Appropriateness on the following grounds:

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<sup>59</sup> *Id.* at § 2.7.1.F.2.

<sup>60</sup> *Id.* at § 9.14.2.F.

<sup>61</sup> *Id.* at § 9.10.2.C.

<sup>62</sup> *Id.*

<sup>63</sup> *Id.*

1. Arresting and spectacular effects
2. Violent contrasts of materials or colors and intense or lurid colors
3. A multiplicity or incongruity of details resulting in a restless and disturbing appearance
4. The absence of unity and coherence in composition, that is not in consonance with the dignity and character of the present structure, in the case of repair
5. Construction of, remodeling, or enlargement of an existing building in a manner not consistent with the prevailing character of the neighborhood.<sup>64</sup>

Importantly, while these are all valid grounds for denial, the HRB has broad discretion to approve a Certificate of Appropriateness for a major project or to decide on actions to impose on major projects located within the Beaufort Historic District.<sup>65</sup>

The Code references multiple documents that the HRB can rely on when determining if a Certificate of Appropriateness should be issued.<sup>66</sup> These documents are used “to provide guidance and insight into desirable goals and objectives for the Beaufort Historic District.”<sup>67</sup> Which documents are considered by the HRB depends on whether the project is located in the “*Beaufort Preservation Neighborhood*” (BPN) or the “*Beaufort Conservation Neighborhood*” (BCN).<sup>68</sup> While the Code adopts the documents for use by the HRB, it is important to keep in mind that the ultimate decision on whether to approve, approve with conditions, or deny a certificate of appropriateness rests with the HRB’s discretion.

In both the BPN and BCN sub-districts, the HRB must consider the Secretary of Interior's Standards for Rehabilitation. Under federal rules, “rehabilitation” is defined as “the process of returning a building or buildings to a state of utility, through repair or alteration, which makes possible an efficient use while preserving those portions and features of the building and its site . . . which

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<sup>64</sup> *Id.* at § 9.10.2.E.

<sup>65</sup> *Id.* at 9.10.2.

<sup>66</sup> *Id.* at § 9.10.2.B.

<sup>67</sup> *Id.*

<sup>68</sup> *Id.*



are significant to its historic . . . values.”<sup>69</sup> The Department of the Interior has enumerated ten Standards for Rehabilitation,<sup>70</sup> which are intended to generally assist the HRB during rehabilitation projects.<sup>71</sup> The Standards for Rehabilitation recommend that restoration of historic properties should minimally change the property’s defining qualities, maintain the historic character, and not destroy the property’s historic materials with exterior alterations or related new construction.<sup>72</sup> While there are guidelines for applying the Standards for Rehabilitation generally to rehabilitation projects, these guidelines are not useful for case-specific advice, to address exceptions, or for rare circumstances.<sup>73</sup> Instead, they are best understood as the articulation of “basic philosophical principals which are fundamental to historic preservation.”<sup>74</sup>

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<sup>69</sup> 36 CFR § 67.2.

<sup>70</sup> *Id.* at § 67.7. These standards include: “(1) A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment. (2) The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided. (3) Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken. (4) Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved. (5) Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved. (6) Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence. (7) Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible. (8) Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken. (9) New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment. (10) New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.” *Id.*

<sup>71</sup> *Secretary’s Standards for Rehabilitation*, NAT’L PARK SERV., <https://www.nps.gov/tps/standards/rehabilitation.htm> (last visited Aug. 7, 2019).

<sup>72</sup> 36 CFR § 67.7.

<sup>73</sup> *Secretary’s Standards for Rehabilitation*, *supra* note 71.

<sup>74</sup> JOHN MILNER ASSOCIATES, THE BEAUFORT PRESERVATION MANUAL SUPPLEMENT 3 (1990), <https://sc.beaufort.civicplus.com/DocumentCenter/View/1005/Preservation-Manual-Supplement-?bidId> (last visited Aug. 7, 2019) [hereinafter SUPPLEMENT].

Given these broad standards, Beaufort's HRB is likely able to provide a Certificate of Appropriateness to an owner of a historic property, if the major project implemented adaptation measurements to protect the house from flood risks, so long as there was a threat of damage and the response was proportional.

In addition to the Standards for Rehabilitation and any special standards adopted by the HRB,<sup>75</sup> the HRB must also take into consideration the Beaufort Preservation Manual (Manual) and the Beaufort Preservation Manual Supplement (Supplement), when considering a Certificate of Appropriateness in BPN.<sup>76</sup> Both documents were made with the intent to "assist the residents and the City government in preserving Beaufort's unique and characteristic physical environment."<sup>77</sup>

The Manual was created "to provide a guide to sympathetic maintenance and preservation of the man-made elements in the Beaufort Landmark Historic District."<sup>78</sup> This document contains a whole section on "weatherproofing." However, this section only provides preservation guidance on features such as gutters and downspouts, or preferred roofing repair guidelines. While this document was meant to stress "appropriate repair and maintenance procedures," it would not provide appropriate guidance for owners of historic properties who wish to safeguard their property against serious flood damage.<sup>79</sup>

The Supplement is meant to provide "design guidelines and associated regulatory procedures" involved in Beaufort's preservation goals.<sup>80</sup> The Supplement divides design guidelines into three categories: recommended, not recommended, and inappropriate.<sup>81</sup> Recommended approaches, treatments, and techniques are those that are "likely to promote the preservation and protection of the Beaufort Historic District."<sup>82</sup> Approaches, treatments, and techniques that are not recommended are ones that might adversely affect the historic district.<sup>83</sup> Finally, the inappropriate designation is reserved for actions that will adversely

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<sup>75</sup> *Id.*

<sup>76</sup> Beaufort Code § 10.7.

<sup>77</sup> SUPPLEMENT, *supra* note 74, at ix.

<sup>78</sup> JOHN MILNER ASSOCIATES, THE BEAUFORT PRESERVATION MANUAL VII (1979), <https://sc-beaufort.civicplus.com/DocumentCenter/View/999/Preservation-Manual-?bidId=> (last visited Aug. 7, 2019).

<sup>79</sup> SUPPLEMENT, *supra* note 74, at ix.

<sup>80</sup> *Id.*

<sup>81</sup> *Id.* at xiii.

<sup>82</sup> *Id.*

<sup>83</sup> *Id.*

affect the historic district.<sup>84</sup> However, the Supplement recognizes that there may be specific instances where “inappropriate” designs may be desirable, while “recommended” ones are disfavored due to the diversity of construction techniques and materials. Therefore, whether to approve a certain design characteristic should be discretionary and made on a case-by-case basis.<sup>85</sup> Thus, like the Manual, the Supplement does not specifically address or recommend projects homeowners should undertake in order to protect their property against flooding. Because this document is not meant to provide strict standards, a homeowner would likely be able to adapt their historic property to flooding risks, so long as the applicant could convince the HRB that the flood risk is great and the response is proportional.

On the other hand, when deciding whether to issue a Certificate of Appropriateness in the BCN the HRB must take into consideration the Northwest Quadrant Design Principles. A few sections in this document are pertinent to homeowners who want to protect their historic property from flood damage. Section 20 discusses raised cottages, and recommends that raised cottages should remain so. This section acknowledges that raising structures helps protect them against water damage from tropical storms.<sup>86</sup> Section 14 of this document provides that “work should not destroy the distinguishing qualities or character of the property and its environment.”<sup>87</sup> Like the other documents described above, the Northwest Quadrant Design Principles merely provide guidance for projects. Therefore, if a property owner of a historic property wants to undergo a project to protect their house from flood damage that destroys some distinguishing qualities or character of the structure, it is likely that HRB could approve such a project under the guidelines of the Northwest Quadrant Design Principles.

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<sup>84</sup> *Id.*

<sup>85</sup> *Id.*

<sup>86</sup> CITY OF BEAUFORT, NORTHWEST QUADRANT DESIGN PRINCIPLES 44 (1999), <https://sc-beaufort.civicplus.com/DocumentCenter/View/998/Northwest-Quadrant-Design-Principles-?bidId> (last visited Aug. 7, 2019).

<sup>87</sup> *Id.* at 35.

*ii. HRB's Active Role in Promoting Historic Preservation through Stabilization*

If the HRB<sup>88</sup> finds a historically significant structure is “threatened with destruction or loss due to failure on the part of the property owner to properly maintain or repair the structure,” then the HRB will conduct a public hearing to determine if the property is being “demolished by neglect.”<sup>89</sup> Once the HRB determines that a historically significant property is being demolished, it has a duty to develop “specifications for the stabilization of the property,” which the homeowner must complete.<sup>90</sup> Economic relief may be available to a property owner if they prove to the HRB that stabilization imposes an undue economic burden.<sup>91</sup> Economic relief may come in the form of property tax relief, loans or grants, or acquisition by purchase or eminent domain, among others.<sup>92</sup>

If a property owner fails to complete the specifications identified by the HRB, the city may move to stabilize the structure itself.<sup>93</sup> Once the city moves to stabilize a structure, it can place a lien on the property in order to be reimbursed by the property owner for its stabilization efforts.<sup>94</sup> This means that if a property owner fails to reimburse the city, Beaufort could seize title to the property after stabilizing the structure.

Importantly, the language of the “demolished by neglect” ordinance is broad enough to encompass properties damaged by flooding. Therefore, the ordinance can be used to promote stabilization when properties risk losing their historic characteristics due to a failure to incorporate appropriate household scale changes that would protect the home from flood damage. After the HRB determines that stabilization is necessary to protect a historic property from flood damage, it can then be completed by the homeowner or by the city if the

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<sup>88</sup> It is important to note that while the Beaufort Code of Ordinances refers to the “board of architectural review,” the HRB is established as the board of architectural review under section 10.7.1. of the Code.

<sup>89</sup> Beaufort Code of Ordinances § 5-1202(c). A “significant structure” under the City of Beaufort Ordinances, is defined as “a structure in the Historic District determined to be a contributing structure according to National Register criteria, or a structure in the Historic District which the board of architectural review...reasonably considers to be historically or architecturally significant.” *Id.* at § 5-1201.

<sup>90</sup> *Id.* at § 5-1202.

<sup>91</sup> *Id.* at § 5-1205.

<sup>92</sup> *Id.* at § 5-1205(f).

<sup>93</sup> *Id.* at § 5-1203.

<sup>94</sup> *Id.* at § 5-1204.

homeowner fails to take identified steps required by the HRB. In this way, the HRB can play an active role in promoting historic preservation after inadequately protected homes risk losing their historic characteristics due to flood damage.

While Beaufort can move to stabilize a property itself, other options are available to the city to promote preservation of historic structures at risk of being demolished. Indeed, Beaufort has a history of working with the community in order to promote historic preservation. One example involved a historic property located in the Old Commons neighborhood called the Mulligan Grayson House. Built between 1875 and 1880 by black artisans after Emancipation, the Mulligan Grayson House was bought in 2005 by the Baptist Church of Beaufort for \$230,000.<sup>95</sup> After the church purchased the historic property, the house sat empty for seven years after the HRB required renovations that would cost up to \$400,000 before the church could use the property as a ministry center.<sup>96</sup> Further, the HRB quickly denied the Church's plan to demolish the property to put in place a prayer garden in 2012, reasoning that the house was too valuable and that the historic integrity of the property should be maintained.<sup>97</sup> After the HRB denied the proposed demolition, Beaufort's Redevelopment Commission entered into a "land swap" agreement with the Church. In this agreement, the city acquired title to the Mulligan Grayson House in exchange for two nearby properties.<sup>98</sup> After the city engaged in the land swap, the historic property was stabilized before it was sold to be renovated into a single-family home, thus preserving its historic characteristics.<sup>99</sup>

This example shows that Beaufort can use creative tools to work with the community in order to promote stabilization of historic homes that have been demolished by neglect. Beaufort should use these creative tools and the economic relief mechanisms discussed above in order to promote historic preservation of historic homes that risk being demolished due to inadequate protection against flooding damage when seizure of properties is undesirable.

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<sup>95</sup> *Id.*

<sup>96</sup> *Id.*

<sup>97</sup> *Id.*

<sup>98</sup> Erin Moody, *Renovations to begin soon on historic Mulligan Grayson House*, THE ISLAND PACKET (Mar. 1, 2014), <https://www.islandpacket.com/news/business/article33559359.html> (last visited Aug. 7, 2019).

<sup>99</sup> *Id.*

B. The Zoning Board of Appeal's Power to Promote Historic Preservation through Appropriate Application of Beaufort's "Community Standards"

Homeowners located in a "special flood hazard areas" (SFHA), as determined by the Federal Emergency Management Agency (FEMA), can obtain affordable flood insurance under the National Flood Insurance Program (NFIP). Before these homeowners are eligible for assistance under the NFIP, their local government must adopt and enforce floodplain management regulations, also called "community standards." To provide its citizens with assistance under the NFIP, Beaufort has enacted community standards under Section 5-4032 of the Beaufort Code of Ordinances.

While Beaufort's floodplains were last mapped in 1986, approximately 38.3% of Beaufort structures are located within a SFHA under the Effective Flood Insurance Rate Map (FIRM).<sup>100</sup> Further, much of the downtown area, which contains the bulk of the historic landmarks, falls in a SFHA, meaning that all properties located within the SFHA must comply with the community standards in order to receive federal flood insurance assistance.<sup>101</sup>

Beaufort's community standards contain requirements aimed at reducing the risks homeowners face due to flood damage. The community standards require that residential structures that undergo new construction, substantial improvement, or additions greater than 33% of the structure's footprint "shall have the lowest floor elevated no lower than the base flood elevation," and prohibit the building of any basements.<sup>102</sup> Further if "foundation perimeter walls [are] used to elevate a structure, openings sufficient to facilitate the unimpeded movement of floodwaters shall be provided."<sup>103</sup>

If an owner of a building fails to comply with these requirements, the city manager or his or her designee can issue a stop-work order.<sup>104</sup> The city manager may take further action and revoke the development permit for "any substantial departure from the approved application."<sup>105</sup> After notice and an opportunity to be heard, if the property owner fails to take corrective action after a violation of the

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<sup>100</sup> WOOD ENV'T & INFRASTRUCTURE SOLUTIONS, *supra* note 3, at 4.

<sup>101</sup> *Id.*

<sup>102</sup> Beaufort Code of Ordinances § 5-4032.

<sup>103</sup> *Id.*

<sup>104</sup> *Id.* at § 5-4021.

<sup>105</sup> *Id.* at § 5-4024.

permit has been identified, the city manager “may issue such order to alter, vacate, or demolish the building.”<sup>106</sup> Further, this failure to take corrective action can result in a misdemeanor.<sup>107</sup>

While the community standards apply generally to all structures located in the SFHA, Beaufort provides variances for property owners of historic structures.<sup>108</sup> In order to obtain a variance, the homeowner must submit a request to the Zoning Board of Appeals (ZBOA).<sup>109</sup> The ZBOA must consider certain conditions when determining whether to grant a homeowner of a historic property a variance under the community standards.<sup>110</sup> For instance, variances should not be issued “when the variance will make the structure in violation of other federal, state, or local laws, regulations, or ordinances” or “for unpermitted development or other development that is not in compliance” with Beaufort’s ordinances.<sup>111</sup> Likewise, variances should be issued only “upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.”<sup>112</sup> Further conditions for issuing a variance include:

[A] showing of good and sufficient cause, a determination that failure to grant the variance would result in exceptional hardship, and a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisance, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.<sup>113</sup>

After consideration of these conditions, the ZBOA may issue a variance if it finds “that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure,” as well as that “the variance is the minimum necessary to preserve the historic character and design of the structure.”<sup>114</sup>

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<sup>106</sup> *Id.*

<sup>107</sup> *Id.*

<sup>108</sup> *Id.* at § 5-4043.

<sup>109</sup> *Id.* at § 5-4041.

<sup>110</sup> *Id.* at § 5-4048.

<sup>111</sup> *Id.*

<sup>112</sup> *Id.*

<sup>113</sup> *Id.*

<sup>114</sup> *Id.* at § 5-4043.

As this article has shown, homeowners of historic properties may undertake even substantial measures if necessary to protect the structure, without risking de-listing from the National Register, which effects both state and federal historic designations. Therefore, the ZBOA can actively promote preservation through carefully considering which historic houses are eligible for variances from the community standards. To promote adaptation to flood risks, the ZBOA should only grant variances from the community standards when they represent what is minimally necessary for the homeowner to preserve the historic character and design of the structure.

**V. RESILIENCE EFFORTS IN HISTORIC ANNAPOLIS: A POSSIBLE GUIDE FOR BEAUFORT**

The city of Annapolis, Maryland became a National Historic Landmark District in 1965.<sup>115</sup> Like Beaufort, historic structures in Annapolis are at risk from flooding due to sea level rise. For instance, Annapolis had an average of 39.3 days of nuisance flooding between 2007 and 2013.<sup>116</sup> In order to combat against this threat to its historic structures, Annapolis has taken a proactive approach in planning for its future. The city started the “Weather It Together” initiative to address “the issue of protecting and adapting the City’s cultural resources to an increasing risk from flooding.”<sup>117</sup>

This initiative recognized the need for a hazard mitigation plan catered to the needs of historic properties. Therefore, in 2018, the initiative followed FEMA’s “how-to guide” for mitigation planning on the state and local government level for historic properties and cultural resources<sup>118</sup> to develop a Cultural Resource Hazard Adaptation and Mitigation Plan (CRHMP).<sup>119</sup> Using FEMA’s approach, the CRHMP assesses risks to historic assets, develops a

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<sup>115</sup> PETE GUTWALD, WEATHER IT TOGETHER: A CULTURAL RESOURCE HAZARD MITIGATION PLAN FOR THE CITY OF ANNAPOLIS 1 (2018), <https://www.annapolis.gov/DocumentCenter/View/10064/Consolidated-CRHMP-Report-April-2018> (last visited Aug. 8, 2019).

<sup>116</sup> *Id.* at 13.

<sup>117</sup> *Id.*

<sup>118</sup> FED. EMERGENCY MGMT. AGENCY, INTEGRATING HISTORIC PROPERTY AND CULTURAL RESOURCE CONSIDERATIONS INTO HAZARD MITIGATION PLANNING: STATE AND LOCAL MITIGATION PLANNING HOW-TO GUIDE (2005), [https://www.fema.gov/pdf/fima/386-6\\_Book.pdf](https://www.fema.gov/pdf/fima/386-6_Book.pdf) (last visited Mar. 3, 2019).

<sup>119</sup> GUTWALD, *supra* note 115, at 41.



mitigation plan, implements the plan, monitors progress, and organizes reassures in four different phases.<sup>120</sup>

In developing the CRHMP, the Weather It Together team identified forty-eight actionable ideas. The group then organized these ideas into nine projects. Notably, the projects identified in the CRHMP cover not only changes to individual houses such as elevation, but also includes structural adaptation measures, such as stormwater infrastructure improvements, which work to safeguard houses on a neighborhood or city-wide scale.

In order to better protect its historic resources for the future, Beaufort would likely benefit from developing a planning document similar to the Annapolis CHRMP. While the DOI's Standards for Rehabilitation, Beaufort Manual and Supplement, and Northwest Quadrant Design Principles provide general guidance for maintaining historic structures for the future, Beaufort has not yet developed a comprehensive vision for protecting these assets in the face of persistent flooding. A similar document would not only be helpful for individuals wishing to protect their own properties, but would also provide guidance for the HRB when issuing Certificate of Appropriateness and the city in adopting ordinances that reflect the community's desire to preserve its historic structures.

## VI. CONCLUSION

The city of Beaufort, South Carolina, is one of the nation's most appreciated historical communities, which is shown in the amount of federal and state support Beaufort homeowners receive in preservation efforts. At the federal level, Beaufort's downtown is listed on the National Register as a NHL under the NHPA, and there are numerous other properties in the city listed on the National Register as well. Federal designation on the National Register provides owners of historic properties incentives for preservation and rehabilitation of their property. South Carolina also provides tax credits to incentivize property owners to preserve and rehabilitate their properties. These state incentives expand the number of recipients that can receive rehabilitation incentives under the federal scheme. Both the federal and state incentive schemes require property owners to comply with the Standards when rehabilitating historic properties.

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<sup>120</sup> *Weather It Together: Overview*, CITY OF ANNAPOLIS, <https://www.annapolis.gov/885/Weather-It-Together> (last visited Aug. 8, 2019).

While federal and state governments have clearly indicated their support for the preservation of historic properties, the incentive programs must reflect changing local conditions that will adversely affect preservation efforts. Notably, the success of rehabilitation incentive programs will partially depend on a homeowner's ability to adapt their properties to rising sea levels. Fort Pulaski, located about ten miles outside of Beaufort County, has calculated that sea level is rising at a rate of one foot per century since the station was established in 1935.<sup>121</sup> Further, recent studies have shown that the oceans are warming faster than previously predicted,<sup>122</sup> which will only continue to increase the rate of sea level rise. The effect of sea level rise on local flooding is further heightened due to tide cycles and storm surge. With a 1-2 foot increase in base sea level, South Carolina Sea Grant has predicted that extreme high tides could cause "significant property damage in properties not built to current FEMA flood zone standards."<sup>123</sup> This reflects just how vulnerable Beaufort's historic properties will be to flooding in the future.

Because of Beaufort's vulnerability to sea level rise, local zoning and planning decisions should support preservation efforts that implement smart adaptation strategies on the household-scale. To support such preservation efforts, the city's ZBOA may encourage homeowners of historic properties to adapt to sea level rise through limiting the number of variances available in the flood damage prevention ordinances. Second, Beaufort's HRB should grant Certificates of Appropriateness for preservation efforts that seek to adapt historic properties to sea level rise. Finally, the City of Beaufort can develop a mitigation plan, as was used in Annapolis, that utilizes FEMA's "how-to guide" for mitigation planning in order to develop a CRHMP. These actions would provide homeowners with further incentives and support to preserve historic properties in Beaufort from rising sea levels.

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<sup>121</sup> S.C. SEA GRANT CONSORTIUM, SEA LEVEL RISE ADAPTATION REPORT: BEAUFORT COUNTY, SOUTH CAROLINA 4 (2015), [http://www.scseagrant.org/pdf\\_files/Beaufort-Co-SLR-Adaptation-Report-Digital.pdf](http://www.scseagrant.org/pdf_files/Beaufort-Co-SLR-Adaptation-Report-Digital.pdf) (last visited Aug. 8, 2019).

<sup>122</sup> Lijing Cheng et al., *How Fast are the Oceans Warming? Observational Records of Ocean Heath Content Show that Ocean Warming is Accelerating*, 363 SCIENCE 128 (2019). This article states that recent studies show the rate of ocean warming in the decades after 1991 have increased from .55 to .68 W/m<sup>2</sup> in the upper 2000-meter water column.

<sup>123</sup> S.C. SEA GRANT CONSORTIUM, *supra* note 121, at 10.

SHORE PROTECTION FOR A SURE TOMORROW:  
EVALUATING COASTAL MANAGEMENT LAWS IN SEVEN SOUTHEASTERN STATES

Julia M. Shelburne<sup>1</sup>

I. INTRODUCTION

Shoreline erosion is a natural geological process, but it becomes a problem when anthropocentric activities are adversely impacted. Sea level rise increases shoreline erosion by shifting coastal waters landward, displacing sediment, and increasing flooding, which in turn affects property ownership.<sup>2</sup> Coastal states have enacted shore protection laws based on various policy goals ranging from protecting property to preserving public beach access to conserving coastal ecosystems in response to shoreline erosion. As sea levels rise, the effectiveness of these laws is tested. Policymakers may soon face pressure to reconsider shore protection laws or risk leaving ineffective laws in place, so an analysis of existing laws is increasingly relevant.

Coastal erosion occurs when wind and waves transport sediments from the shore. In fact, sediments are in constant motion on the beach.<sup>3</sup> Beaches are the primary defense against severe weather events, coastal erosion, and sea level rise.<sup>4</sup> Specifically, sand dunes serve as natural barriers against wind and waves by absorbing storm surge energy and offering beach stabilization through the root

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<sup>2</sup> NIKI L. PACE, WETLANDS OR SEAWALLS? ADAPTING SHORELINE REGULATION TO ADDRESS SEA LEVEL RISE AND WETLAND PRESERVATION IN THE GULF OF MEXICO, 26 J. LAND USE & ENVTL. L. 327 (2011); CARL H. HOBBS, THE BEACH BOOK: SCIENCE OF THE SHORE 144-160 (2012); Omar Defeo et al., *Threats to Sandy Beach Ecosystems: A Review*, 81 ESTUARINE, COASTAL & SHELF SCIENCE 1, 1-12. Federal coastal management laws and the public trust doctrine are outside the scope of this research.

<sup>3</sup> The movement of sediments is called littoral drift or longshore drift. GIS software, aerial photographs over time, and other modeling methods can reveal such movement. See Chester W. Jackson Jr. et al., *Application of the AMBUR R Package for Spatio-Temporal Analysis of Shoreline Change: Jekyll Island, Georgia, USA*, 41 COMPUTERS & GEOSCIENCES 199 (2012).

<sup>4</sup> Here, the shoreline refers to the location where the water meets the land. The beach is defined as the land covered in sand along the shore.

systems of coastal vegetation on those dunes.<sup>5</sup> In addition, beaches provide many ecosystem services such as biodiversity and recreation. When beaches erode, the consequences can be extensive. For example, habitat loss has contributed to the endangerment of all U.S. sea turtle species and many migratory shorebirds.<sup>6</sup> While beaches offer unique habitats for biodiversity, they also provide value through recreation and tourism.<sup>7</sup> To protect the ecosystem services beaches provide while balancing interests to develop coastal property, state governments have created jurisdictional areas using setback lines where some development may occur with a permit.

This article discusses the setback lines creating shoreline jurisdictional areas in seven states in the Southeast and Mid-Atlantic: Alabama, Florida, Georgia, Maryland, North Carolina, South Carolina, and Virginia. Part II provides a summary of evidence related to both sea level rise and coastal erosion on beaches in the southeastern United States. Part III describes the governing shore protection laws, particularly the jurisdictional area delineating where persons can and cannot build without a permit. The statutes and regulations of these seven southeastern states are reviewed using a framework of fixed, floating, hybrid, or other setback lines.<sup>8</sup> The analysis of each state includes excerpts of exemptions and enforcement provisions to provide a better scope of how the shores are protected. Finally, Part IV presents an adaptive management approach in which state laws would include methods to regularly review setback lines at given intervals and suggests future research avenues. While acknowledging the uniqueness of each state in terms of policy objectives, geography, and other relevant state laws, implementing provisions requiring regular review of setback lines is the best method to protect shores over fixed or floating lines.

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<sup>5</sup> *Shoreline & Waterway Management: Dune Protection and Improvement*, STATE OF DEL., <http://www.dnrec.delaware.gov/swc/shoreline/pages/duneprotection.aspx> (last visited Aug. 14, 2019).

<sup>6</sup> See Jacques-Olivier Laloë et al., *Climate Change and Temperature-Linked Hatchling Mortality at a Globally Important Sea Turtle Nesting Site*, 23 *GLOBAL CHANGE BIOLOGY* 4922 (2017); *Coastal Bird Conservation*, AUDUBON, <http://ny.audubon.org/conservation/coastal-bird-conservation> (last visited Aug. 14, 2019).

<sup>7</sup> Eva Kaján & Jarkko Saarinen, *Tourism, Climate Change and Adaptation: A Review*, 16 *CURRENT ISSUES IN TOURISM* 167 (2013).

<sup>8</sup> Dennis J. Hwang, *Shoreline Setback Regulations and the Takings Analysis*, 13 *U. HAW. L. REV.* 1 (1991).

## II. EVIDENCE OF SEA LEVEL RISE AND EROSION IN THE SOUTHEASTERN UNITED STATES

Sea level rise is one of the most visible effects of climate change.<sup>9</sup> In the southeastern United States, the sea level has risen approximately eight inches in the past 100 years and current projections show that the rate of sea level rise is expected to accelerate in the next 100 years.<sup>10</sup> Chesapeake Bay waters have risen approximately one foot in the past century and are predicted to rise an additional 1.3 to 5.2 feet in the next century.<sup>11</sup> Infrastructure is at risk as more flooding and extreme weather events pressure public services such as transportation and sewer systems.<sup>12</sup> Furthermore, sea level rise contributes to wetland and habitat loss, as well as causing saltwater intrusion that affects energy systems and agricultural production by inundating freshwater used for irrigation.<sup>13</sup>

Sea level rise also imposes an undue burden on under-resourced populations raising environmental justice concerns.<sup>14</sup> The effects of climate change are already pressuring communities to migrate inland.<sup>15</sup> For example, the Biloxi-Chitimacha-Choctaw Indians on the Isle de Jean Charles in Louisiana are among the climate-vulnerable tribal coastal communities pressured to relocate, which presents significant economic, cultural, health, and human rights concerns.<sup>16</sup> This is just a snapshot of environmental and social issues resulting

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<sup>9</sup> See DONALD J. WUEBBLES ET AL., UNITED STATES GLOBAL CHANGE RESEARCH PROGRAM, 2018: CLIMATE SCIENCE SPECIAL REPORT: FOURTH NATIONAL CLIMATE ASSESSMENT, VOLUME I [hereinafter NATIONAL CLIMATE ASSESSMENT], [https://science2017.globalchange.gov/downloads/CSSR2017\\_FullReport.pdf](https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf) (last visited Aug. 14, 2019).

<sup>10</sup> *Id.*

<sup>11</sup> Coastal erosion is especially apparent on the Chesapeake Bay's Tangier Island in Virginia. The island has shrunk an average of eight acres per year since 1850. *Climate Change*, CHESAPEAKE BAY PROGRAM, [https://www.chesapeakebay.net/issues/climate\\_change](https://www.chesapeakebay.net/issues/climate_change) (last visited Aug. 14, 2019); Simon Worrall, *Tiny U.S. Island is Drowning. Residents Deny the Reason*, NAT'L GEOGRAPHIC, Sept. 7, 2018, <https://www.nationalgeographic.com/environment/2018/09/climate-change-rising-seas-tangier-island-chesapeake-book-talk/> (last visited Aug. 14, 2019).

<sup>12</sup> Shana Jones et al., *Roads to Nowhere in Four States: State and Local Governments in the Atlantic Southeast Facing Sea-Level Rise*, 44 COLUMBIA J. OF ENVTL. L. 1 (2019).

<sup>13</sup> NATIONAL CLIMATE ASSESSMENT, *supra* note 9, at 13.

<sup>14</sup> Mathew E. Hauer, *Migration Induced by Sea-Level Rise Could Reshape the US Population Landscape*, 7 NATURE CLIMATE CHANGE 321 (2017).

<sup>15</sup> NATIONAL CLIMATE ASSESSMENT, *supra* note 9, at 322.

<sup>16</sup> Julie Koppel Maldonado et al., *The Impact of Climate Change on Tribal Communities in the U.S.: Displacement, Relocation, and Human Rights*, 120 CLIMATIC CHANGE 601 (2013); Eli Keene, *Resources for Relocation: In Search of a Coherent Federal Policy on Resettling Climate-Vulnerable Communities*, 48 TEX. ENVTL. L.J. 119 (2018).

from sea level rise and erosion, and demonstrates the timely need to evaluate shore protection state laws as tools to defend coastal communities and ecosystems.

### III. SHORE PROTECTION LAWS IN SEVEN SOUTHEASTERN STATES

Three broad types of beach management strategies to combat erosion exist: beach nourishment, coastal armoring, and retreat.<sup>17</sup> Beach nourishment is a “soft armoring” technique in which sand is added to the shore to mitigate erosion. Despite avoiding the shortcomings of coastal “hard” armoring options, beach nourishment is expensive and disturbs wildlife habitats like turtle nesting locations.<sup>18</sup> Further, adding sand to a dynamic, eroding beach is only a temporary solution, so beach nourishment eventually becomes beach renourishment.<sup>19</sup> Coastal armoring techniques, like seawalls, also impact habitats for wildlife and vegetation.<sup>20</sup> Coastal armoring is expensive, and the construction of hard structures increases the rate of erosion on the beach as the slope offshore steepens.<sup>21</sup> The third type of management tool is retreat. Retreat prevents development from encroaching onto beaches mitigating habitat loss and protecting property from storm damage.<sup>22</sup> Shore protection laws apply to all three types of coastal management, but the permitting process for certain activities examined in this article fits best within the retreat category.

Shore protection laws establish setback lines to form jurisdictional areas. The purpose of jurisdictional areas is to stabilize shorelines between the land and the sea by permitting only certain activities and preventing development too close

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<sup>17</sup> *Coastal Armoring*, UNIVERSITY OF CALIFORNIA, SANTA BARBARA: EXPLORE BEACHES, <http://explorebeaches.msi.ucsb.edu/beach-health/coastal-armoring> (last visited Aug. 14, 2019).

<sup>18</sup> *Beach Nourishment*, UNIVERSITY OF CALIFORNIA, SANTA BARBARA: EXPLORE BEACHES, <http://explorebeaches.msi.ucsb.edu/beach-health/beach-nourishment> (last visited Aug. 14, 2019); Boris Worm et al., *Impacts of Biodiversity Loss on Ocean Ecosystem Services*, 314 *SCIENCE* 787 (2006); Megan Mullin et al., *Paying to Save the Beach: Effects of Local Finance Decisions on Coastal Management*, 152 *CLIMATIC CHANGE* 275 (2018).

<sup>19</sup> Charles H. Peterson & Melanie J. Bishop, *Assessing the Environmental Impacts of Beach Nourishment*, 55 *BIOSCIENCE* 887 (2005).

<sup>20</sup> A.T. Williams et al., *The Management of Coastal Erosion*, 156 *OCEAN & COASTAL MGMT.* 4 (2018).

<sup>21</sup> *Coastal Armoring*, *supra* note 17.

<sup>22</sup> Frank E. Marshall & K. Banks, *Shoreline Habitat: Beaches*, in *INTEGRATED CONCEPTUAL ECOSYSTEM MODEL DEVELOPMENT FOR THE SOUTHEAST FLORIDA COASTAL MARINE ECOSYSTEM* 94 (W.K. Nuttle & P.J. Fletcher eds., 2013), <https://repository.library.noaa.gov/view/noaa/9408> (last visited Aug. 14, 2019).

to the ocean.<sup>23</sup> Setback lines are used to identify where development seaward of certain physical beach features is prohibited – an area often referred to as the “no-build area” – and where development landward of those features may occur with an approved permit. In this way, jurisdictional lines reduce costs associated with rebuilding after major weather events or flooding by preventing development in the most vulnerable coastal areas. Therefore, shore protection laws are particularly relevant to protect the government from bearing substantial costs resulting from environmental damage.<sup>24</sup> In fact, most southeastern states identify the cost of restoring damaged shorelines as a primary justification for enacting coastal management laws.<sup>25</sup>

All of the states reviewed use “fixed,” “floating,” “hybrid,” or “other” setback lines to establish the jurisdictional areas for coastal development.<sup>26</sup> Fixed setback lines identify a length from certain features (i.e., elevation contours, shore protection structures, mean high or low water marks) while floating setback lines vary by measuring and applying coastal erosion rates. North Carolina, South Carolina, and Virginia apply coastal erosion rates while Alabama and Maryland use specific lengths from certain features to identify jurisdictional areas. Florida applies both fixed and floating setback lines depending on the location. Georgia originally applied a unique formula, but the Georgia General Assembly changed the jurisdictional area to a fixed setback line in May 2019.<sup>27</sup>

Fixed setback lines are bright-line rules, so they are easier to identify and enforce as they are more consistent across the state. Most laws establishing fixed setback lines, however, do not have a procedure to update the lines as the geographic features anchoring those lines change. The lack of a formal procedure to review the setback lines prevents states from applying the best available science to sea level rise. Floating setback lines are more difficult to identify and enforce because unlike state plane coordinates or a similar method to establish a statewide line, the line applies a formula using erosion rates which vary by location. More specific information is needed for specific locations. Thus, states with legal provisions to adjust floating setback lines follow the adaptive management approach more closely and probably offer better shore protection.

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<sup>23</sup> Legal provisions regarding coastal erosion control structures, such as living shorelines and shoreline armoring permits, are outside the scope of this research.

<sup>24</sup> Sathya Gopalakrishnan et al., *Economics of Coastal Erosion and Adaptation to Sea Level Rise*, 8 ANN. REV. OF RESOURCE ECON. 119 (2016).

<sup>25</sup> GA. CODE ANN. § 12-5-230 and § 12-5-231.

<sup>26</sup> Hwang, *supra* note 8.

<sup>27</sup> GA. CODE ANN. § 12-5-232.

A. Fixed Setback Lines: Certain Jurisdictional Areas for an Uncertain Future

Alabama and Maryland use fixed setback lines to distinguish the no-build zone from the area that may allow certain permitted activities.<sup>28</sup> These lines are consistent across the state, but the laws lack a formal procedure to update the jurisdictional area based on emerging data. In Alabama, the line covers the two coastal counties: Mobile and Baldwin. In Maryland, Ocean City is the only ocean-fronting location.

i. *Alabama*

Alabama's Department of Environmental Management establishes a fixed setback line through the Alabama Coastal Area Management Program (ACAMP) within the coastal area to protect coastal area resources.<sup>29</sup> The inland boundary of the coastal area is the continuous contour line ten feet above mean sea level from the Mississippi-Alabama state line extending eastward through Baldwin and Mobile Counties to the Alabama-Florida state line.<sup>30</sup> The coastal area outward boundary is the limit of the United States territorial sea.<sup>31</sup> Within the coastal area, construction and substantial improvements are prohibited on land between the mean high tide line and the coastal construction control line.<sup>32</sup>

The construction control line (CCL) is Alabama's statewide, fixed minimum setback which uses state plane coordinates for identification.<sup>33</sup> No statutory provisions exist to update the CCL. In one part of the coastal area, the coordinates are based on local monuments.<sup>34</sup> In another part, the CCL is forty feet landward of the most inland crestline except in business, touring, and lodging

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<sup>28</sup> Georgia's Shore Protection Committee or an authorized local unit of government determines the fixed shorefront jurisdictional line using information gathered from site inspections, photographs, and similar techniques to best protect the sand-sharing system. The Coastal Resources Division Staff for the Shore Protection Committee marks the jurisdictional line with survey flags or tape creating the no-build area. *Id.* § 12-5-235.

<sup>29</sup> ALA. CODE §§ 9-7-12, 9-7-15.

<sup>30</sup> *Id.* § 9-7-10; ALA. ADMIN. CODE r. 335-8-1-.02(k).

<sup>31</sup> ALA. CODE § 9-7-10.

<sup>32</sup> ALA. ADMIN. CODE r 335-8-2-.08(1). Substantial improvement refers to any improvement increasing the structure size and is otherwise subject to local building ordinances that is equal to or more than 50% of the structure's fair market value. *Id.* r 335-8-1-.02(jjj)(2).

<sup>33</sup> *Id.* r 335-8-1-.02(p).

<sup>34</sup> *Id.*



(BTL) and business central resort (BCR) zones.<sup>35</sup> In the BTL and BCR zones, the CCL is five feet landward of the most inland crestline.<sup>36</sup>

Permits are required for proposed activities landward of the coastal CCL that would result in a significant impact on coastal resources.<sup>37</sup> Proposed activities must coincide with the program's list of permissible uses.<sup>38</sup> Permissible uses include agriculture, emergency activities, normal maintenance, minor activities, and research and conservation efforts.<sup>39</sup> Specifically, permits are required for the removal or alteration of primary dune systems, beach sands or vegetation, construction, or any substantial improvement landward of the CCL within the coastal area.<sup>40</sup> A permit is also required for the construction of single family dwellings and duplexes, as well as commercial and residential developments larger than five acres adjacent to coastal waters, intercepted by the CCL, or on wetlands, unless the project otherwise requires a federal permit.<sup>41</sup>

Variances may be granted through an application process when property would be taken without compensation or is unduly restrictive. To get a variance, there must not be a feasible alternative and negative impacts must be minimized.<sup>42</sup> The variance can include additional conditions to limit the project's impacts on the coastal area. In 1994, Alabama's enforcement provision was repealed.<sup>43</sup>

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<sup>35</sup> ALA. ADMIN. CODE r. 335-8-1-.02(p). The crestline is the line connecting the peaks of the dunes in the primary dune system. *Id.* r. 335-8-1-.02(q).

<sup>36</sup> *Id.* r. 335-8-1-.02(p).

<sup>37</sup> *Id.* r. 335-8-2-.01. A significant impact is the result of any activity with more than a negligible adverse effect on the coastal area. *Id.* r. 335-8-1-.02(bbb).

<sup>38</sup> ALA. CODE §§ 9-7-13, 9-7-20; ALA. ADMIN. CODE r. 335-8-1-.05.

<sup>39</sup> ALA. CODE § 9-7-13(a)(8). Activities must also comply with air and water quality standards and consider potential negative impacts on designated historical, architectural, or archaeological sites, critical habitats, and public access to recreational resources. ALA. ADMIN. CODE r. 335-8-2-.01. Some temporary activities, like using beach umbrellas and volleyball equipment, that occur seaward of the CCL are not subject to the ACAMP permits if all materials are removed from the area prior to inclement weather. *Id.* r. 335-8-2-0.8(8).

<sup>40</sup> ALA. ADMIN. CODE r. 335-8-2-.08.

<sup>41</sup> *Id.* r. 335-8-2-.11. Structures containing more than two dwelling units must submit an Environmental Impact and Natural Hazards Study. *Id.* r. 335-8-2-.08(3)(d).

<sup>42</sup> *Id.* r. 335-8-1-.13.

<sup>43</sup> *Id.* r. 335-8-1-.32.

ii. *Maryland*

Most of Maryland's coastal management laws pertain to the Chesapeake Bay, which is not ocean-fronting.<sup>44</sup> Maryland's Department of Natural Resources (MDNR) follows the Beach Erosion Control and Replenishment Act to identify the Beach Erosion Control District and protect the beach and dunal systems.<sup>45</sup> The Beach Erosion Control District protects Ocean City, Maryland from coastal erosion and sea level rise as Ocean City is the only municipality facing the Atlantic Ocean on the state's barrier island. Maintaining the beach and dunal systems, controlling sediment movement, and protecting against storms may reduce restoration costs.<sup>46</sup>

The Beach Erosion Control District is the area of land between the boundary line of Maryland and Delaware, the Atlantic Ocean, the Ocean City inlet to the south, and the State-Ocean City building limit line to the west.<sup>47</sup> The local district establishes the setback line ("State-Ocean City Building Limit Line") that covers the jurisdictional area seaward to the ocean.<sup>48</sup> The boundary of the State-Ocean City Building Limit Line is identified by control points, which are surveying points similar to Alabama's state plane coordinates identifying the CCL.<sup>49</sup> The State-Ocean City Building Limit Line generally coincides with Ocean City's building limit line, as well as with the crest of the littoral system.

Prohibited actions within the Beach Erosion Control District are land clearing, construction activity, and the construction of permanent structures.<sup>50</sup> The MDNR or the Worcester County Natural Resources Division of the Department of Environmental Programs ("Natural Resources Division") approves permits for acceptable activities in the Beach Erosion Control District.<sup>51</sup> The environmental impact, navigational impact, recreational potential, and commercial benefit are

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<sup>44</sup> Georgia Sea Grant is currently researching coastal wetland protections laws in these seven states. Legal provisions governing the protection of the Chesapeake Bay against coastal erosion and sea level rise will be analyzed in that upcoming publication.

<sup>45</sup> MD. CODE. ANN., NAT. RES. §§ 8-1101-8-1102.

<sup>46</sup> *Id.* § 8-1101.

<sup>47</sup> Specifically, the Beach Erosion Control District is Ocean City and Assateague Island. *Id.* § 8-1105.1.

<sup>48</sup> *Id.*

<sup>49</sup> MD. CODE REGS. 08.09.02.02.

<sup>50</sup> MD. CODE. ANN., NAT. RES. § 8-1102; MD. CODE REGS. 08.09.01.02.

<sup>51</sup> *Shoreline Construction*, WORCESTER COUNTY, MARYLAND, <http://www.co.worcester.md.us/departments/env/natural/shore> (last visited Aug. 15, 2019).

considered in the permit review process.<sup>52</sup> Public comment is also taken into account, as well as the effect on surrounding property values by any development.<sup>53</sup> Both the MDNR and the Natural Resources Division have authority to enforce permits, but no specific statutory or regulatory enforcement provisions exist in the Act.<sup>54</sup>

### *iii. Georgia*

Georgia's Shore Protection Act of 1979 was designed to protect the state's coastal sand dunes, beaches, sandbars, and shoals, together known as the sand-sharing system.<sup>55</sup> The system serves as the interdependent buffer that defends barrier islands from ecosystem damage due to severe weather events and erosion. The sand-sharing system is important for the promotion of recreation, public health and safety, and the economy. Reconstruction and rehabilitation of the sand-sharing system is "costly, if not impossible," so the Shore Protection Act seeks to conserve the buffer for "present and future use."<sup>56</sup> The jurisdictional area, termed the dynamic dune field, covers land from the setback line to the ordinary low water mark.<sup>57</sup> In May 2019, Georgia changed its setback line.<sup>58</sup>

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<sup>52</sup> *Id.*

<sup>53</sup> *Id.*

<sup>54</sup> See MD. CODE REGS. 08.09.01.03.

<sup>55</sup> GA. CODE ANN. §§ 12-5-230-12-5-231.

<sup>56</sup> *Id.*

<sup>57</sup> *Id.*; *Rolleston v. State*, 266 S.E.2d 189, 191-192 (1980). Perhaps not surprisingly Georgia's jurisdictional line was challenged soon after its enactment for being unconstitutionally vague. In 1980, the Shore Assistance Committee denied a property owner's permit application to build a bulkhead for erosion control on Sea Island, yet approved permits for a revetment by a nearby property owning corporation. The property owner appealed and argued that the Act was unconstitutionally vague. The Supreme Court of Georgia held that the resulting zig zag jurisdictional line "tree line" was rationally related to the Shore Protection Act, the Shore Protection Act was clear and unambiguous, and denying a property owner's permit while granting others was not arbitrary, discriminatory, or unconstitutional. The court acknowledged that the "tree line" indicates a stable area but is a moving line; in some instances, trees marking the line have fallen implying a newly unstable area. The line then moves landward to the next qualifying tree. On the same note, a permit is required for the clearing of vegetation or landscaping, so the "tree line" is not subject to manipulation. This case was the first interpretation of the Shore Protection Act, and established the law's constitutionality and the Department's jurisdiction to approve or deny permits. The property owner also argued that federal law preempted beach regulation to the high water mark, but since the argument was raised on appeal, the Supreme Court of Georgia did not rule on the merits.

<sup>58</sup> GA. CODE ANN. § 12-5-232(8).

From 1979 to early 2019, Georgia's setback line was unique because it connected live, native trees twenty feet in height or greater to any structure existing on July 1, 1979 as long as the distance between the two types of features was a reasonable distance no more than 250 feet.<sup>59</sup> No other state in this study area draws its setback line in this way. As Figure 1 indicates below, this created a zig-zag line as the upper, landward boundary of the dynamic dune field. This approach was unique because, while the jurisdictional line could move if a tree or structure is removed, the line ultimately was not designed to do so – and, for example, when a feature such as a tree fell, the line moved to the next qualifying tree.<sup>60</sup> The line stayed relatively fixed and allowed for movement based on dynamic information such as erosion rates. Even so, the resulting zig-zag jurisdictional line was difficult for managers in Georgia to enforce. Further, the jurisdictional line was problematic because it included areas that did not necessarily require protection (e.g., parking lots) while excluding areas that were within the sand-sharing system.

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<sup>59</sup> *Id.* A real estate appraiser may determine that an existing structure, shoreline engineering activity, or other alteration at the landward boundary of the dynamic dune field has been more than 80% destroyed by weather events or erosion, the landward boundary will be as if the structure did not exist on July 1, 1979. *Id.*

<sup>60</sup> *Rolleston*, 266 S.E.2d at 191.

Aerial View

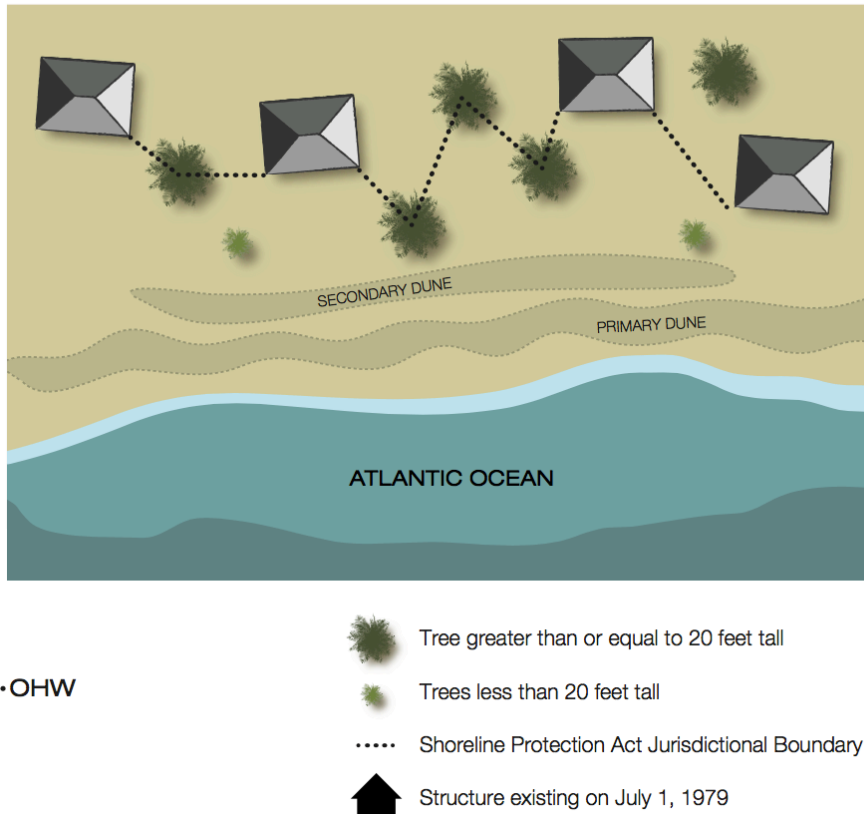


Figure 1. Carl Vinson Institute of Government, 2015.

In May 2019, Georgia enacted a new fixed setback line making the jurisdictional dynamic dune field area more predictable and enforceable.<sup>61</sup> Rather than connecting live native trees taller than twenty feet to a pre-1979 structure, the landward line is now the first occurrence of either the seaward most portion of a pre-1979 structure or twenty-five feet landward of the landward toe of the most landward sand dune. Alternatively, the setback line is now twenty-five feet landward of the crest of a serviceable stabilization activity. If a sand dune or a serviceable stabilization activity are absent, the line must be twenty-five feet landward of the ordinary high water mark.<sup>62</sup> State-owned property follows a

<sup>61</sup> GA. CODE ANN. § 12-5-232.

<sup>62</sup> *Id.* A serviceable shoreline stabilization activity involves an artificial method of changing the topography or vegetation of components within the sand-sharing system, such as beach renourishment, that requires only minimal maintenance.

different fixed line; the line must be 100 feet landward of the ordinary high water mark.<sup>63</sup>

While the Shore Protection Act's policy objective remains to protect the sand-sharing system, not all construction or development is prohibited. Rather, the following three categories of activities are allowed if a permit is granted: any construction of a structure such as a building; shoreline engineering projects,<sup>64</sup> or alterations of the natural topography<sup>65</sup> or vegetation of land within the jurisdictional area.<sup>66</sup> Because the Shore Protection Act grandfathered activities prior to July 1, 1979, permits are not required for structures, shoreline engineering activity, or land alteration that existed on or before July 1, 1979 unless any modification, addition, or extension of the activity would have a negative impact on the sand-sharing system.<sup>67</sup> However, permits for reconstruction are required if grandfathered structures, shoreline engineering activity, or land alterations have been damaged by more than 80% of the fair market value from wind, water, or erosion.<sup>68</sup> These reconstruction permits may become increasingly necessary as sea level rise stresses the shoreline.<sup>69</sup>

Projects that will affect the jurisdictional dynamic dune field area may be permitted if a series of requirements are met: the proposed activity occupies the landward part of the parcel and is landward of the sand dunes if feasible; more

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<sup>63</sup> *Id.*

<sup>64</sup> Permits for shoreline engineering activity or land alteration on beaches, sand dunes, or submerged lands are issuable if activities are temporary and the area affected will be restored upon project completion to promote the functions of the sand-sharing system. If shoreline stabilization is necessary and no reasonable or feasible alternative exists, "low-sloping porous rock structures or other techniques which maximize the dissipation of wave energy and minimize shoreline erosion" shall be used. *Id.* § 12-5-239(c)(3).

<sup>65</sup> Permits for construction of a pier, boardwalk, or crosswalk on beaches, eroding sand dune areas, or submerged lands will be granted if the natural vegetation and topography are restored after the project and the activity will maintain the sand-sharing system functions. *Id.* § 12-5-239(c)(2).

<sup>66</sup> *See id.* § 12-5-239(c)(2)(A).

<sup>67</sup> In addition, the potential permittee may be eligible for letters of permission to exempt some activity from requiring a permit. The Department of Natural Resources must provide public notice describing the activity and location at least 15 days before the activity begins. However, public notice is not required for activity that is necessary for public safety or the delivery of public services. In addition, the Shore Protection Committee or authorized local unit of government can implement immediate action in the event of an emergency to protect the public interest. *Id.* § 12-5-237(b).

<sup>68</sup> *Id.*

<sup>69</sup> The Shore Protection Committee reviews permit applications. Committee members maintain the authority to issue orders, grant, suspend, revoke, modify, extend, condition, or deny permits. The committee may also renew permits if certain conditions are met. *Id.* § 12-5-235.

than 30% of the parcel will be retain its natural vegetation and topography; the proposed project follows applicable hurricane-resistant standards; activities are minimized and temporary; the natural vegetation and topography are restored using best available technology upon project completion; and the proposed project will uphold the functions of the sand-sharing system.<sup>70</sup>

Public interest considerations based on reasonableness are a key standard to granting a permit.<sup>71</sup> First, the permitted project must not cause unreasonable harm to the sand-sharing system. The reasonableness standard balances the interests of the proposed activity against the protection of the shore. Second, the project must not unreasonably interfere with sea turtle or shorebird conservation. Finally, the project must not unreasonably interfere with recreational use and enjoyment of public properties.<sup>72</sup> Once a permit is granted, the project may continue without an additional permit if the activity does not further alter the natural topography or vegetation of the site or increase the size or scope of the project, and remains in serviceable condition.<sup>73</sup>

The Department of Natural Resources Shore Protection Committee has the authority to enforce permits for lack of conformance, violations, or non-compliance with other local, state, or federal laws.<sup>74</sup> Enforcement is authorized when individuals violate the conditions of their permit or alter the dynamic dune field or submerged lands without an approved permit. Violations, encompassing both acting without a permit and violating permit conditions, are considered a public nuisance and may result in a temporary restraining order, permanent or temporary injunction, or other order.<sup>75</sup> The appropriate corrective action is to return the sand dunes, beaches, and submerged lands to their condition prior to the violation.<sup>76</sup>

Similarly, individuals who alter the dynamic dune field or submerged lands without a valid permit are liable in damages to the “state and any political subdivision of the state” for “any and all actual and projected costs and expenses

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<sup>70</sup> *Id.* § 12-5-239(c); GA. COMP. R. & REGS. 391-2-2-.02.

<sup>71</sup> *One Hundred Miles v. Shore Prot. Comm.*, No. 1630908-60, 2016 WL 8711743, at 22-24 (Ga. Bd. Nat. Res. Aug. 26, 2016) (holding that a permit for construction of a rock groin, beach nourishment, and dune construction was appropriate on Sea Island in Glynn County).

<sup>72</sup> *Id.*

<sup>73</sup> GA. CODE ANN. § 12-5-237(a).

<sup>74</sup> The Shore Protection Committee can determine compliance using photos, topographic data, on-site inspections, academic literature, and other data. *Id.*; *see also Id.* §§ 12-5-235 and 12-5-239.

<sup>75</sup> *Id.* § 12-5-245.

<sup>76</sup> *Id.* § 12-5-247.

and injuries occasioned by such alteration.”<sup>77</sup> Specifically, the damages shall cover the actual and projected cost of restoring the sand-sharing system and replacing the vegetation destroyed by the alteration of the dynamic dune field or submerged lands.<sup>78</sup> Provisions of Georgia’s Shore Protection Act can be enforced by a temporary restraining order, injunction, requiring restoration of the affected lands to their prior condition, or restitution for damages. A maximum fine of \$10,000 may also be issued for each violation.<sup>79</sup>

A. Floating Setback Lines: Using Erosion Rates to Create Jurisdictional Areas

State laws establishing floating setback lines provide procedures to update setback lines based on the best available scientific data. These laws more closely align with adaptive management techniques, especially in applying an iterative approach for science-based decision-making. North Carolina, South Carolina, Virginia, and Florida apply floating regulations. In these states, setback lines are reevaluated on established intervals.<sup>80</sup>

i. *North Carolina*

North Carolina’s Department of Environmental Quality Coastal Resources Commission (Commission) regulates jurisdictional boundaries, or “development lines,” for shore protection within North Carolina’s coastal area through the North Carolina Coastal Area Management Act of 1974 (CAMA). Specifically, CAMA’s policy objective is to preserve coastal resources. North Carolina’s coastal area includes the counties along the Atlantic Ocean and coastal sound.<sup>81</sup> Under CAMA, the Commission has the authority to mandate erosion change rates to determine the oceanfront construction setback line and setback lines in Areas of Environmental Concern (AECs).<sup>82</sup>

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<sup>77</sup> *Id.* § 12-5-247(c).

<sup>78</sup> *Id.*

<sup>79</sup> *Id.* § 12-5-247(b).

<sup>80</sup> South Carolina, for example, has recently reviewed proposals for new setback lines. The OCRM expects new coordinates will be released in early 2019. *State Beachfront Jurisdictional Lines*, S.C. DEP’T OF HEALTH AND ENVTL. CONTROL, <https://www.scdhec.gov/environment/your-water-coast/ocean-coastal-management-ocrm/beach-management/state-beachfront> (last visited Aug. 15, 2019).

<sup>81</sup> N.C. GEN. STAT. ANN. § 113A-103(2-3).

<sup>82</sup> *Id.* §§ 113A-100, 113A-104, and 113A-107.1; 15A N.C. ADMIN. CODE 7H.0305(10) and 7J.0102.



The oceanfront construction setback line is measured by a setback factor based on shoreline changes or by the size of structure. The minimum setback factor is two, even when the shoreline is accreting. The setback factor is used for the long-term average erosion rate. The Commission reviews the long-term average erosion rate about every five years.<sup>83</sup> The review process uses the end-point method, which involves comparing aerial photographs of the current shoreline with the earliest aerial photograph. The process takes about a year to complete. Once the new long-term average erosion rate is determined, the Commission approves the setback line after allowing public comment.<sup>84</sup>

In AECs, development is limited. For example, lots created after 1979 must meet the following requirements: apply the appropriate erosion rate setback factor; occur as landward as possible without violating zoning requirements; not extend seaward of the landward-most adjacent building; and be less than 2,000 square feet. Within AECs, there are Ocean Hazard Areas. These areas receive additional protection due to their greater vulnerability to erosion. Ocean Hazard Areas are determined by “geologic, vegetative, and soil conditions [that] indicate a substantial possibility of excessive erosion or flood damage” and include beaches, frontal dunes, and inlet lands.<sup>85</sup> Inlet Hazard Areas, the Ocean Erodible Area, and unvegetated beach area are subsets of Ocean Hazard Areas within the AECs.<sup>86</sup> North Carolina has established both no-build areas and setback procedures for structures based on size in Ocean Hazard Areas. Construction is prohibited seaward of the ocean hazard setback distance and may not be established below the mean high water line.<sup>87</sup>

Setbacks for permissible development are either landward of the crest of the primary dune or based on the Ocean Hazard Setback, whichever is most

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<sup>83</sup> “Long-term” is about 50 years. *What You Should Know About Erosion Oceanfront Development*, N.C. ENVTL. QUALITY, <https://deq.nc.gov/about/divisions/coastal-management/coastal-management-oceanfront-shorelines/what-you-should-know-about-erosion-oceanfront-development> (last visited on Aug. 15, 2019).

<sup>84</sup> *Id.*

<sup>85</sup> Frontal dunes are dunes with the first mound of sand located landward of the ocean beach that has stable and natural vegetation present. 15A N.C. ADMIN. CODE 7H.0301 and 7H.0305 (2019).

<sup>86</sup> 15A N.C. ADMIN. CODE 7H.0304. Since these zones, especially Inlet Hazard Areas, are more vulnerable to erosion, the density of permanent structures cannot exceed “more than one commercial or residential unit per 15,000 square feet of land area on lots subdivided or created after July 23, 1981,” and “only residential structures of four units or less or non-residential structures of less than 5,000 square feet total floor area” may be constructed. *Id.* 7H.0310.

<sup>87</sup> 15A N.C. ADMIN. CODE 7H.0306.

landward.<sup>88</sup> If there is not a primary dune, the setback is landward of the frontal dune. Ocean Hazard Setbacks, listed in Table 1, are based on size of the structure or the annual shoreline erosion rate, whichever is greater and measured from the first line of static vegetation.<sup>89</sup> The setback distance increases as the size of the structure increases, as opposed to the size of the development.<sup>90</sup>

Structure Size (ft <sup>2</sup> )	Minimum Setback (ft)	Annual Shoreline Erosion Rate (ft)
Less than 5,000	60	30
5,000-9,999	120	60
10,000-19,999	130	65
20,000-39,999	140	70
40,000-59,999	150	75
60,000-79,999	160	80
80,000-99,999	170	85
100,000 or more	180	90

Table 1. Data gathered from 15A N.C. ADMIN. CODE 7H.0306 (2019).

A permit is required for any proposed development.<sup>91</sup> Development on structures existing on or before June 1, 1979 must comply with certain location criteria and design standards.<sup>92</sup> Reconstruction may occur in an Ocean Hazard Area if developers comply with CAMA regulations, building codes, the National

<sup>88</sup> Primary dunes are the “first mounds of sand located landward of the ocean beaches with an elevation equal to mean flood level... plus six feet” that “extend landward to the lowest elevation in the depression behind that same mound of sand (commonly referred to as the ‘dune trough’).” *Id.* 7H.0305(3).

<sup>89</sup> *Id.* 7H.0305(6) and 7H.0306.

<sup>90</sup> *Busik v. N.C. Coastal Res. Comm’n*, 753 S.E.2d 326 (N.C. Ct. App. 2013).

<sup>91</sup> Development is: “[A]ny activity... involving, requiring, or consisting of the construction or enlargement of a structure; excavation; dredging; filling; dumping; removal of clay, silt, sand, gravel or minerals; bulkheading; driving of pilings; clearing or alteration of land as an adjunct to construction; alteration or removal of sand dunes; alteration of the shore, bank, or bottom of the Atlantic Ocean or any sound, bay, river, creek, stream, lake or canal.” N.C. GEN. STAT. ANN. § 113A-103(5). Development does not include public utility activities, roadwork, agricultural or forestry, activities, maintenance or repairs to damaged property, projects grandfathered under the statute, or construction that does not require dredging, filling, or the alteration of a sand dune or beach. *Id.* Camping, accessways to beaches, pools, elevated decks less than 500 square feet, gazebos, uninhabited sheds, temporary amusement stands, sand fences, and some parking may be constructed seaward of the setback lines if they remain landward of the vegetation line and comply with other conditions. 15A N.C. ADMIN. CODE 7H.0309.

<sup>92</sup> 15A N.C. ADMIN. CODE 7H.0104 and 7H.0309(b-c).

Flood Insurance Program, and local reconstruction plans.<sup>93</sup> Some projects may be permitted under the Commission's general permit program.<sup>94</sup> Permits must include the condition that structures will be removed or relocated if it becomes imminently threatened by shoreline changes.<sup>95</sup>

Variances may be granted when "unnecessary hardships would result from strict application of the rules, standards, or orders," such as a hardship to comply with a setback requirement.<sup>96</sup> The hardship must not be a result of the landowners' actions.<sup>97</sup> Setback lines in Ocean Hazard Areas may be waived for structures built on lots that existed before June 1, 1979 if development occurs at least sixty feet from the vegetation line, is not in front of or on a frontal dune, meets size and design standards, and satisfies all other relevant regulations. This waiver does not apply to Inlet Hazard Areas or unvegetated beach areas.<sup>98</sup>

Beach fill projects that will be in effect for at least thirty years with sediment or storm protection greater than 300,000 cubic yards may also be eligible for exceptions if the community identifies the appropriate sediment and source of project funding. These exceptions are available only to structures less than 2,500 square feet and not seaward of the most landward adjacent structure.<sup>99</sup> Single family residences within AECs are also exempt from CAMA permits if they are forty feet landward of the normal high-water mark and do not disturb land within that buffer.<sup>100</sup> Finally, all federal agency development activities are exempt.<sup>101</sup>

The Commission and Local Permit Officers monitor compliance with major, minor, and general CAMA permits using various methods, such as aerial flights. If a person is violating a permit or beginning development without an approved permit, the Commission staff has the authority to provide a Notice of Violation, stop the development, and determine the penalty. The corrective action is usually restoring the site to its condition prior to the violation. Civil penalties

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<sup>93</sup> *Id.* 7M.0503.

<sup>94</sup> N.C. GEN. STAT. ANN. § 113A-118.1.

<sup>95</sup> 15A N.C. ADMIN. CODE 7H.0306(k). CAMA permits are not required for small ditches, activities in Jockey's Ridge, sand-fencing installation, projects requiring NPDES or air quality permits, and structural accessways over frontal dunes in AECs. 15A N.C. ADMIN. CODE 7K.0200.

<sup>96</sup> N.C. GEN. STAT. ANN. § 113A-120.1(a).

<sup>97</sup> *Id.*; *Riggings Homeowners, Inc. v. Coastal Res. Comm'n*, 747 S.E.2d 301 (N.C. Ct. App. 2013).

<sup>98</sup> 15A N.C. ADMIN. CODE 7H.0309.

<sup>99</sup> *Id.* 7H.0306.

<sup>100</sup> *Id.* 7K.0208.

<sup>101</sup> *Id.* 7K.0402.

may not exceed \$10,000 for major and \$1,000 for minor development violations. Costs may also result from Coastal Management monitoring activities to ensure compliance.<sup>102</sup> Furthermore, injunctive relief or a Class 2 misdemeanor may be an appropriate action for a violation.

ii. *Virginia*

Virginia's Coastal Primary Sand Dunes Act and Barrier Island Policy establish the jurisdictional boundaries and permitting process for shore protection on beaches, coastal primary sand dunes, and barrier islands.<sup>103</sup> The policy objective of this Act is to protect the ecosystem and its functions. Virginia's coastal zone extends across approximately 5,000 miles of shoreline and 29% of the state's land area. Further, more than 60% of Virginia's population resides in the coastal zone.

On Virginia's beaches, the no-build area extends from the low water line to the marked change in material composition or physiographic form, line of woody vegetation, or nearest impermeable manmade structure.<sup>104</sup> On coastal primary sand dunes, the no-build area is between the mean high water mark and where the landward dune grade falls below 10%.<sup>105</sup> On barrier islands, the setback is twenty times the local 100-year long-term annual shoreline erosion rate from the dune crest.<sup>106</sup> If the local mean high water mark comes within ten times the average erosion rate, a new plan to revise the setback line must be submitted to

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<sup>102</sup> *Id.* 7J.0409; N.C. GEN. STAT. ANN. § 113A-126.

<sup>103</sup> VA. CODE ANN. § 28.2-1401.

<sup>104</sup> The beach begins at the low water line and extends landward to the "marked change in material composition or physiographic form, the line of woody vegetation, or the nearest impermeable manmade structure." *Id.* § 28.2-1400.

<sup>105</sup> The coastal primary sand dune is a "mound of unconsolidated sandy soil which is contiguous to mean high water, whose landward and lateral limits are marked by a change in grade from ten percent or greater to less than ten percent" with certain species: "American beach grass (*Ammophila breviligulata*); beach heather (*Hudsonia tomentosa*); dune bean (*Strophostyles* spp.); dusty miller (*Artemisia stelleriana*); saltmeadow hay (*Spartina patens*); seabeach sandwort (*Honckenya peploides*); sea oats (*Uniola paniculata*); sea rocket (*Cakile edentula*); seaside goldenrod (*Solidago sempervirens*); Japanese sedge or Asiatic sand sedge (*Carex kobomugi*); Virginia pine (*Pinus virginiana*); broom sedge (*Andropogon virginicus*); and short dune grass (*Panicum amarum*)." VA. CODE ANN. § 28.2-1400.

<sup>106</sup> 4 VA. ADMIN. CODE 20-440-10(C)(1)(c)(4). The dune crest is "the highest elevation of the coastal primary sand dune on the lot." 4 VA. ADMIN. CODE 20-440-10(A)(1). The local 100-year long-term recession rate is the "average shoreline recession over fixed one-mile intervals averaged over the period between surveys of 100 years or more." *Id.*

the state.<sup>107</sup> The Virginia Institute of Marine Science (VIMS) provides the Virginia Marine Resources Commission (VMRC) or local wetlands board with data pertaining to erosion rates.

No permanent structures, except some vehicular access ramps, are permitted seaward of the crest of any coastal primary sand dune.<sup>108</sup> This prevents roads and trails from being built on or across any coastal primary sand dune or in any wetland.<sup>109</sup> Construction or permanent alteration is not allowed on beaches or coastal primary sand dunes when such development would impair ecological functions, destroy vegetation, or physically modify the beach or coastal primary sand dunes.<sup>110</sup> In addition, structures that have been condemned by health or local building officials due to damage from natural events may not be reconstructed. Such structures must be relocated or removed within two years.<sup>111</sup>

The VMRC or a certified local wetlands board reviews permit applications. Permits are granted if both the public and private benefit outweigh the detriment, and the proposed development is consistent with the standards listed in VA. CODE. ANN. § 28.2-1401 and VA. CODE. ANN. § 28.2-1408.<sup>112</sup> Specifically, coastal development may only occur when there will not be a significant negative impact on the ecosystem or when the development aligns with the public interest.<sup>113</sup> The permit application must include a site survey showing one-foot contours relative to local mean high water to the first wetlands vegetation and identification of the dune crest, among other features.

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<sup>107</sup> *Id.* 20-440-10(E)(1)(c).

<sup>108</sup> *Id.* 20-440-10(C)(2)(b).

<sup>109</sup> *Id.* 20-440-10(C)(3) (2018).

<sup>110</sup> VA. CODE. ANN. § 28.2-1408.

<sup>111</sup> Written authorization from the Commission is required for relocation. 4 VA. ADMIN. CODE 20-440-10(B)(2).

<sup>112</sup> VA. CODE. ANN. § 28.2-1403; 4 VA. ADMIN. CODE 20-440-10(B)(1)(a).

<sup>113</sup> Development is limited to low density single-family use on each platted parcel. Virginia considers the density of the structure and percentage of shoreline frontage those structures occupy. Therefore, less than 25% of the lot must result in adverse impacts and there must be an adequate area that is not sand dunes or wetlands. The minimum frontage for a single-family vacation cottage is 100 feet and the minimum side yard is thirty feet. The setback from the dune crest and septic for all structures is twenty times the local 100-year long-term annual shoreline recession rate. On 100-foot lots, the first floor may be a maximum of 900 square feet. On 200-foot lots, the first floor may not exceed 1800 square feet. This area includes porches, decks, and other appurtenances. The dwellings may not exceed twenty-five feet in height and must be constructed on elevated open pilings greater than or equal to ten feet above grade. Enclosures below the first floor are prohibited. VA. CODE. ANN. § 28.2-1408.

Permits are not required for construction or maintenance of walkways or observation platforms that do not affect the coastal primary sand dunes, sand replenishment activities, sand fence installation, addition of vegetation to stabilize dunes, normal maintenance of erosion control devices abutting dunes and roads, outdoor recreational activities that do not alter the coastal primary sand dune structure, conservation and research activities, or emergencies.<sup>114</sup> However, shore hardening structures are not allowed and artificial barriers, such as sand fencing, are discouraged.<sup>115</sup>

A permit for development may not be required if the restrictions would create an unduly hardship and the development would not result in significant detriment to barrier islands, natural resources, or adjacent property.<sup>116</sup> In addition, the Coastal Primary Sand Dunes and Beaches Act provides exemptions for some development permits through a General Permit for Sand Management and Placement Profiles.<sup>117</sup> Landowners within the Sandbridge Beach Subdivision, the area between Dam Neck Naval Base, Sandpiper Road, and Little Island Park, that are deemed to be in clear, imminent danger may construct and maintain protective structures with the approval of the Virginia Beach Wetlands Board. The City of Norfolk may also adopt a General Permit for Sand Management and Placement Profiles.<sup>118</sup>

To enforce permit provisions or unpermitted actions, the Commission has the authority to investigate activity altering dunes or beaches.<sup>119</sup> Local Wetlands Boards may also investigate projects within their respective jurisdictions.<sup>120</sup> If an activity is deemed a violation upon on-site inspections of the permitted property, the commissioner or board chairman must give notice to the permittee to comply within a certain period.<sup>121</sup> An order shall be issued if the permittee does not comply with the notice of the violation.<sup>122</sup> If the corrective action is completed, the order must be lifted. The appropriate corrective action is usually to return the site to its condition prior to the violation.<sup>123</sup> The order may come in the form of

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<sup>114</sup> *Id.* § 28.2-1403.

<sup>115</sup> 4 VA. ADMIN. CODE 20-440-10(C)(8).

<sup>116</sup> *Id.* 20-440-10(C)(1)(c)(9).

<sup>117</sup> VA. CODE ANN. § 28.2-1408.2.

<sup>118</sup> *Id.* § 28.2-1408.2(B)(2).

<sup>119</sup> *Id.* § 28.2-1416.

<sup>120</sup> *Id.*

<sup>121</sup> *Id.* § 28.2-1417(B).

<sup>122</sup> *Id.* § 28.2-1417(C).

<sup>123</sup> *Id.* §§ 28.2-1417(D) and 28.2-1419; 4 VA. ADMIN. CODE 20-440-10.

“injunction, mandamus, or other appropriate remedy.”<sup>124</sup> If a person “knowingly, intentionally, or negligently violates any order, rule, or regulation of the Commission” or Local Wetlands Board, they are guilty of a Class 1 misdemeanor.<sup>125</sup> Fines must not exceed \$25,000 for each violation. Each day of a continued violation after the conviction is a separate offense.<sup>126</sup>

*iii. South Carolina*

The South Carolina Department of Health and Environmental Control’s Office of Ocean and Coastal Resource Management (OCRM) regulates beachfront development under the South Carolina Coastal Zone Management Act (SCCZMA) and the 1988 Beachfront Management Act (BMA). South Carolina emphasized a policy of retreat with safety, environmental protection, and tourism as primary objectives until 2018.<sup>127</sup> Now, the current policy emphasizes preservation rather than retreat.<sup>128</sup>

The OCRM uses two lines to regulate development in the coastal zone: the baseline and the setback line.<sup>129</sup> The coastal zone protects critical areas, which include coastal waters, tidelands, beach/dune systems, and beaches.<sup>130</sup> The beach/dune system encompasses “all land from the mean high water mark of the Atlantic Ocean landward to the forty-year setback line.”<sup>131</sup> The setback line extends forty times the average annual erosion rate landward of the baseline. This rate is determined by the OCRM using the best available historical and scientific data.<sup>132</sup> The minimum setback is twenty feet landward of the baseline.<sup>133</sup> The setback line is revised every eight to ten years.

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<sup>124</sup> 4 VA. ADMIN. CODE 20-440-10.

<sup>125</sup> VA. CODE ANN. § 28.2-1418.

<sup>126</sup> *Id.*

<sup>127</sup> S.C. CODE ANN. § 48-39-250; S.C. CODE ANN. REGS. 30-1.

<sup>128</sup> *Id.*

<sup>129</sup> S.C. CODE ANN. § 48-39-290(A).

<sup>130</sup> *Id.* § 48-39-10; S.C. CODE ANN. REGS. 30-1(D)(15).

<sup>131</sup> S.C. CODE ANN. REGS. 30-1(D)(5).

<sup>132</sup> S.C. CODE ANN. § 48-39-280.

<sup>133</sup> S.C. CODE ANN. REGS. 30-1(D)(2).

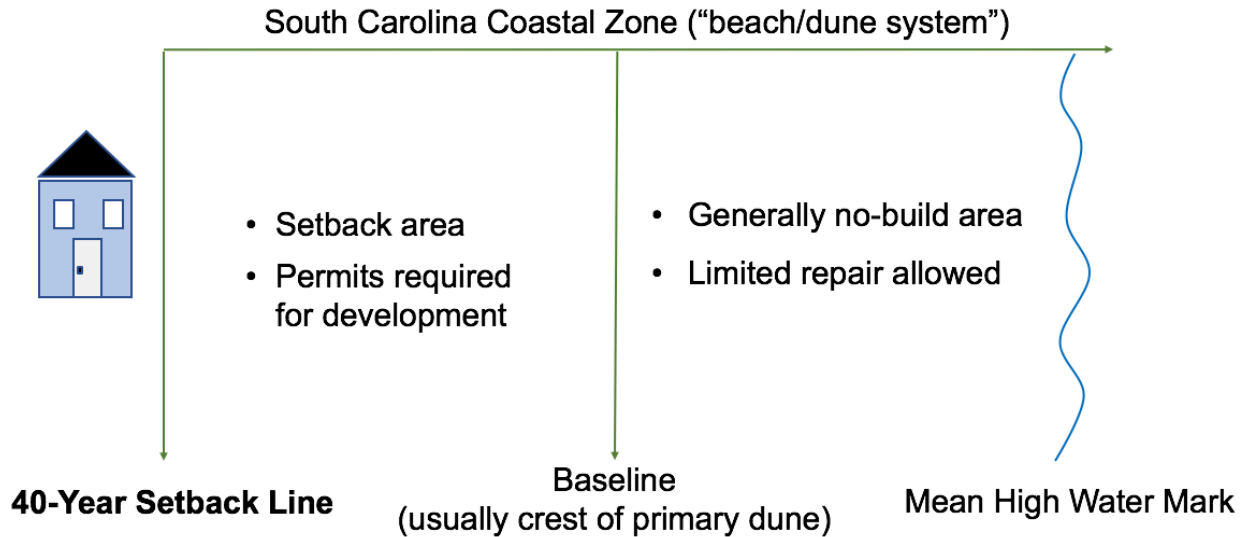


Figure 2. Simplified depiction of South Carolina’s two jurisdictional lines.

The baselines vary by location: standard erosion zones or inlet erosion zones. Standard erosion zones are:

segment[s] of shoreline which [are] subject to essentially the same set of coastal processes, [have] a fairly constant range of profiles and sediment characteristics, and [are] not influenced directly by tidal inlets or associated inlet shoals.<sup>134</sup>

In a standard erosion zone, the baseline is established at the crest of the primary oceanfront sand dune or where the shoreline has been artificially altered to that point as determined by beach profile computations.<sup>135</sup> Inlet erosion zones are “segment[s] of shoreline along or adjacent to tidal inlets which is influenced directly by the inlet and its associated shoals.”<sup>136</sup> Inlet erosion zones are stabilized by “jetties, terminal groins, or other structures.”<sup>137</sup> In an unstabilized inlet zone, the baseline is the most landward point of erosion during the past forty years, unless data indicates that the shoreline is unlikely to return to its former position. In a stabilized inlet zone, the baseline is the actual location of the crest of the primary oceanfront sand dune” of the particular erosion zone.<sup>138</sup>

<sup>134</sup> S.C. CODE ANN. § 48-39-270(6).

<sup>135</sup> *Id.* § 48-39-280(A)(1).

<sup>136</sup> *Id.* § 48-39-270(7).

<sup>137</sup> *Id.* § 48-39-280(A)(2).

<sup>138</sup> *Id.* § 48-39-280(A)(3).



Destruction of beach or dune vegetation is not allowed seaward of the setback line. If there is no feasible alternative, planting new vegetation where possible becomes a condition of the permit to mitigate harm.<sup>139</sup> Construction and improvements are not allowed on the area seaward of the escarpment or the first line of stable natural vegetation, whichever is most seaward. In addition, activities on primary oceanfront sand dunes and erosion control devices seaward of the setback line are prohibited.<sup>140</sup>

Normal maintenance of habitable structures, emergencies, sandbags, sandscraping, renourishment, lawful discharge of treated effluent, walkways over dunes, U.S. Army Corps of Engineers activities, or otherwise lawful activities do not require a permit under the Act.<sup>141</sup> Golf courses, pools landward of erosion control devices, wooden walkways, wooden decks, normal landscaping, fishing piers are also allowed seaward of the baseline.<sup>142</sup>

Proposed construction of new habitable structures seaward of the setback line in critical areas must be as far landward as practicable, less than 5,000 square feet of heated space if habitable, not include an erosion control device as an integral part of the habitable structure, or be constructed on the primary oceanfront sand dune, seaward of the baseline, or on active beach.<sup>143</sup> Permits are required for the construction of parking lots, driveways, emergency vehicle accessways, utilities, drainage structures, sand fences, revegetation, and erosion control structures.<sup>144</sup>

A special permit may be granted for construction or improvement of a structure if the property owner would have no reasonable use for the property otherwise or a public benefit can be demonstrated. Most special permits are only granted in extraordinary circumstances for single-family dwellings smaller than similar structures in the neighborhood (less than 5,000 square feet) that are no

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<sup>139</sup> S.C. CODE ANN. § 48-39-310.

<sup>140</sup> *Id.* t § 48-39-290.

<sup>141</sup> S.C. CODE ANN. § 48-39-130; S.C. CODE ANN. REGS. 30-5.

<sup>142</sup> S.C. CODE ANN. § 48-39-290; S.C. CODE ANN. REGS. 30-15.

<sup>143</sup> S.C. CODE ANN. § 48-39-290(B); S.C. CODE ANN. REGS. 30-13. Active beach is “the area seaward of the escarpment or of the first line of stable natural vegetation, whichever occurs first, measured from the ocean landward.” S.C. CODE ANN. § 48-39-270(13).

<sup>144</sup> S.C. CODE ANN. REGS. 30-15.

further seaward than the adjacent houses unless this would preclude a house from being constructed.<sup>145</sup>

The OCRM may revoke or suspend permits for lack of compliance with notice.<sup>146</sup> Violations of the SCCZMA and BMA can result in civil or misdemeanor criminal penalties.<sup>147</sup> Specifically, persons violating either act could face a cease and desist order, temporary restraining order, misdemeanor charge, a maximum of six months in prison, a \$5,000 fine, or any combination of these. In addition, “mitigation or supplemental restoration/enhancement activities” to restore the site may be the appropriate penalty. For minor violations, a fine between \$50 and \$200 may be issued.<sup>148</sup>

In April 2018, South Carolina shifted away from its policy of retreat.<sup>149</sup> From December 2017 to May 3, 2018, the policy of retreat required that any proposed jurisdictional line be landward of the existing line, even if accretion occurred. The recent change benefitted property owners but received pushback because it requires more expensive beach renourishment programs, placing a higher burden on taxpayers. Now, the baseline will not move seaward, but does not have to shift landward.

*iv. Florida*

Florida’s Department of Environmental Protection (FDEP) regulates shorefront activity and beach preservation across the beach-dune system under the 1965 Dennis L. Jones Beach and Shore Preservation Act.<sup>150</sup> The beach and dune system is:

that portion of the coastal system where there has been or there is expected to be, over time and as a matter of natural occurrence, cyclical and dynamic emergence, destruction, and reemergence of beaches and dunes.<sup>151</sup>

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<sup>145</sup> S.C. CODE ANN. § 48-39-290(D).

<sup>146</sup> S.C. CODE ANN. REGS. 30-8.

<sup>147</sup> S.C. CODE ANN. § 48-39-170.

<sup>148</sup> *Id.*

<sup>149</sup> S.C. CODE ANN. § 48-39-250.

<sup>150</sup> FLA. STAT. ANN. § 161.011.

<sup>151</sup> FLA. ADMIN. CODE ANN. r. 62B-33.002(7).

Florida emphasizes the preservation of beach access and thus discourages the use of hard erosion controls.<sup>152</sup> In 1970, the Florida Legislature established the fifty-foot setback line. In 1985, the Florida Legislature established the thirty-year erosion projection for the coastal CCL in effect today.<sup>153</sup>

The no-build area extends from the seasonal high water line to either thirty times the erosion rate or the coastal CCL, whichever is more seaward. In addition, there are four possible jurisdictional lines ranging from 200 feet on Florida's east coast to 1,000 feet on Florida's west coast.<sup>154</sup> The possible jurisdictional lines are: (1) an erosion control line; (2) a fixed setback of fifty feet from the erosion control line or the mean high water line, whichever is more landward; (3) a floating coastal CCL based on predicted impacts of the 100-year storm surge; and (4) a floating setback determined by the local rate of erosion.<sup>155</sup> In areas that are stable or improving, the minimum setback distance is thirty feet. The erosion control line is the landward extent of the submerged bottoms and shore of the Atlantic Ocean, the Gulf of Mexico, and the bays, lagoons, and other tidal reaches belonging to the state of Florida.<sup>156</sup>

Florida uses coastal CCLs as jurisdictional boundaries for shorefront no-build areas. Control lines differ from setbacks as development seaward of the coastal CCL is limited, but not prohibited.<sup>157</sup> The coastal CCL is set by counties and represents the landward limit of the beach dune system subject to the 100-year storm surge, storm waves, or other predictable weather conditions.<sup>158</sup> The FDEP can shift the coastal CCL further landward than the 100-year storm surge impact zone if the line does not "extend beyond the landward toe of the coastal

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<sup>152</sup> FLA. STAT. ANN. § 161.085; Hwang, *supra* note 8.

<sup>153</sup> FLA. STAT. ANN. § 161.053(12)(b). The 30-year erosion projection of long-term shoreline recession is found using historical maps and photographs, reference monuments, or a "minus one-foot per year" shoreline change rate in areas that are either stable or accreting. FLA. ADMIN. CODE ANN. r. 62B-33.024. The 30-year erosion projection cannot extend landward of the coastal construction control line. Repairs or rebuilding that adds to the existing structure seaward of the 30-year erosion projection are prohibited. Notably, this provision includes helpful diagrams to determine the setback line. *Id.*

<sup>154</sup> FLA. STAT. ANN. § 161.053.

<sup>155</sup> For example, the Florida Keys have a fixed setback line of fifty feet from the mean high water line or from erosion control lines, whichever is more landward. Hwang, *supra* note 8.

<sup>156</sup> FLA. STAT. ANN. § 161.151(3).

<sup>157</sup> *Id.* § 161.052.

<sup>158</sup> *Id.* § 161.053(1)(a).

barrier dune structure that intercepts the 100-year storm surge.”<sup>159</sup> If there is not an established construction control line in the county, the jurisdictional line is set fifty feet from the erosion control lines or from the mean high water line, whichever is more landward.<sup>160</sup>

On coastal barrier islands, the coastal building zone extends from the seasonal high water line to 5,000 feet landward from the coastal CCL or the entire island, whichever is less.<sup>161</sup> If there is not an established coastal CCL on the island, the zone is the area seaward of the most landward velocity zone as determined by the Federal Emergency Management Agency.<sup>162</sup> The coastal building zone may not be less than 2,500 feet landward of the coastal CCL in any case.

Permits for development are required for activities on state-owned lands seaward of the mean high water line or the fifty-foot setback line of any tidal waters.<sup>163</sup> The development may not inhibit public use of the beach seaward of the mean high water line except during construction, unless the interference is necessary to protect the beach or an endangered upland structure.<sup>164</sup> Permits are not granted for coastal inlet jetty construction or its maintenance if a “significant adverse impact” on the beach would result.<sup>165</sup> Florida’s Beach and Shore Preservation Act also requires joint permits for some coastal activities.<sup>166</sup> The coastal activities requiring a joint coastal permit are those occurring on natural sandy beaches or seaward of the high water line, extending into Florida’s

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<sup>159</sup> *Id.* The “100-year storm” is a “shore-incident hurricane or any other storm with accompanying wind, wave, or storm surge intensity having a one percent chance of being equaled or exceeded in any given year.” FLA. ADMIN. CODE ANN. r. 62B-33.002(46).

<sup>160</sup> FLA. STAT. ANN. § 161.052.

<sup>161</sup> *Id.* § 161.55.

<sup>162</sup> *Id.* § 161.54(1).

<sup>163</sup> FLA. STAT. ANN. § 161.041(1). Permits for single-family dwellings may be granted if the parcel was platted before 2014, the owner does not own another parcel immediately adjacent to and landward of the proposed parcel, the proposed dwelling is landward of the frontal dune, and would be located as far landward as practicable without being located seaward of the frontal dune. FLA. ADMIN. CODE ANN. r. 62B-33.005 and r. 62B-34.070. The frontal dune is the “first natural or manmade mound or bluff of sand which is located landward of the beach and which has sufficient vegetation, height, continuity, and configuration to offer protective value.” FLA. STAT. ANN. § 161.053(5)(a)(1).

<sup>164</sup> *Id.* § 161.041(1)(a).

<sup>165</sup> *Id.* § 161.041(1)(b).

<sup>166</sup> A joint permit is a combination of the coastal construction permit, an environmental resource permit, and state lands authorization. *Id.* § 161.041(9).

submerged lands, or affecting the sand distribution on the beach.<sup>167</sup> Federal activities on federally owned property do not require state permits.<sup>168</sup>

If those lines are not applicable to the proposed construction site, the general permit line is determined using one of these standards: twenty-five feet landward of the primary dune feature; fifty feet landward of the top of the bluff with a height greater than fifteen feet; at least 100 feet landward of the vegetation line where there is not coastal armoring, a primary dune, or a bluff taller than fifteen feet; or where construction takes place, at least 250 feet landward of the erosion control line or of the mean high water line, whichever is greater. Only elevated walkovers can extend seaward of the general permit line. Non-habitable major structures that are not landward of a major road or landward of the second line of construction must be less than 6,300 square feet and cover a maximum of 65% of the shore-parallel dimension of the parcel. Finally, projects under the general permit must comply with sea turtle and native vegetation protection requirements.<sup>169</sup>

The FDEP may issue general permits to local governments or issue special classes of permits for the construction of minor structures if those structures would not significantly impact the beach-dune system or sea turtles. The general permit line is the seaward limit of construction or landward of a major road or the second line of construction. General permits may be granted for “dune restoration, dune walkovers, decks, fences, landscaping, sidewalks, driveways, pool resurfacing, minor pool repairs, and other nonhabitable structures” if those structures would not harm the beach-dune system or sea turtles.<sup>170</sup> These permits may also be granted for new construction, additions, repairs, or rebuilding to an existing non-habitable structure, but do not apply to swimming pools.<sup>171</sup>

A permit is not required for development if the development pertains to the:

modification, maintenance, or repair to any existing structure within the limits of the existing foundation which does not require,

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<sup>167</sup> FLA. STAT. ANN. § 161.041; FLA. ADMIN. CODE ANN. r. 62B-49.001.

<sup>168</sup> FLA. ADMIN. CODE ANN. r. 62B-33.004(2)(b).

<sup>169</sup> *Id.* r. 62B-34.060.

<sup>170</sup> FLA. STAT. ANN. § 161.053(17-18).

<sup>171</sup> *Id.*

involve, or include any additions to, or repair or modification of, the existing foundation of that structure.<sup>172</sup>

The FDEP may grant waivers or variances of setback lines if the construction or excavation of a structure includes “adequate engineering data concerning shoreline stability and storm tides related to shoreline topography,” pipeline and pier construction, or if existing structures are closer to the mean high water mark and have not been “unduly affected by erosion.” The proposed development also must comply with the Florida Building Code and other rules.<sup>173</sup> Exemptions may also be granted if the FDEP finds that the relevant shoreline is not impacted by erosion that is substantially damaging to the public.<sup>174</sup>

Similarly, landowners may request review of CCLs that are “unduly restrictive or prevents legitimate use” of the property.<sup>175</sup> The FDEP may adjust the line if it finds the landowner’s request is justified upon review. Additionally, minor activities may be exempt from the permitting process.<sup>176</sup> Exemptions for construction are applicable on islands seaward of the coastal CCL within one mile of the centerline of navigation channels or inlets that have suffered erosion from navigation channel maintenance, but the construction must comply with the Florida Building Code.<sup>177</sup>

Enforcement may involve nuisance, first degree misdemeanor charges, or a maximum of \$10,000 fine for each violation. The FDEP maintains the authority to alter or remove structures below the mean high water line that pose a risk to human life, health, or welfare, or are undesirable or unnecessary, which serves as

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<sup>172</sup> *Id.* § 161.052(6).

<sup>173</sup> *Id.* § 161.052(2).

<sup>174</sup> *Id.* § 161.052(4).

<sup>175</sup> *Id.* § 161.053(2)(a).

<sup>176</sup> These include boat moorings, maintenance of existing beach-dune vegetation, burial of marine life on unvegetated beach, pier removal from the unvegetated beach or seaward of mean high water, temporary emergency vehicular access with immediate restoration, debris removal, limited roof overhang construction, public lifeguard stands, landscaping more than “30 feet landward of the frontal dune, escarpment, or coastal armoring structure” that does not involve excavation of existing grade or destruction or removal of native salt-resistant vegetation, and minor construction and excavation with minimal disturbance. FLA. STAT. ANN. § 161.053(11)(c)(1-9); FLA. ADMIN. CODE ANN. r. 62B-33.004.

<sup>177</sup> FLA. STAT. ANN. § 161.142(3).

an emergency provision. The FDEP's authority also extends to enforcing the relevant and related provisions.<sup>178</sup>

#### IV. ADVANTAGES OF ADAPTIVE MANAGEMENT TECHNIQUES IN SHORE PROTECTION LAWS

Each shoreline responds uniquely to sea level rise based on surrounding development, topography, erosion rates, and the rate of sea level rise. Sea level rise is a dynamic phenomenon, so adaptive management is an advantageous policy tool for coastal management and resiliency. States incorporating adaptive management techniques into legal provisions may offer greater coastal resiliency by using emerging data to adjust jurisdictional areas, much like the procedural provisions in existing state laws identifying coastal erosion rates to establish floating setback lines. In this way, adaptive management better monitors and models shoreline changes to respond to informational gaps regarding the extent of sea level rise on coastal communities.<sup>179</sup>

Adaptive management began as a natural resource management tool in the 1970s to address dynamic environmental issues that were not entirely understood. The iterative approach to manage these environmental issues, albeit costly to staff projects to research shoreline changes, specifically calls for clear goals to reduce uncertainty and acknowledgement thereof, measurable indicators for progress over time, and regular monitoring of outcomes and impacts to inform subsequent decision-making.<sup>180</sup> Adaptive management can only be used when legal provisions allow for iterative decision-making.<sup>181</sup> Therefore, the shore protection laws in Florida, North Carolina, South Carolina, and Virginia better fit the adaptive management approach because they involve review of the coastal erosion rates pertaining to the jurisdictional area at issue.

States considering regular review of jurisdictional areas can choose intervals that align with available resources as measuring coastal erosion rates is

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<sup>178</sup> Fines for violations must not exceed \$10,000. Each day of a continued offense is a separate penalty. The violating person may also be guilty of a first-degree misdemeanor or public nuisance. *Id.* §§ 161.054, 161.081 and 161.121. In addition to the Department, "state attorneys, or other prosecuting officers... and sheriffs and their deputies" may enforce provisions of the Act. *Id.* § 161.071.

<sup>179</sup> Holly Doremus, *Adaptive Management as an Information Problem*, 89 N.C. L. REV. 1455, 1498 (2011).

<sup>180</sup> HOLLY DOREMUS ET AL., CTR. FOR PROGRESSIVE REFORM, MAKING GOOD USE OF ADAPTIVE MANAGEMENT 2 (2011).

<sup>181</sup> *Id.*

expensive and takes time. For example, North Carolina reviews the long-term average erosion rate every five years, with one of those years intensively reviewing the changing shoreline with a computer program and aerial photographs.<sup>182</sup> Florida, on the other hand, updates coastal CCLs after the lines have been rendered ineffective by hydrographic and topographic data or when local officials request a new coastal CCL, despite experts suggesting review every five years.<sup>183</sup>

South Carolina reviews setback lines at least every ten years.<sup>184</sup> Reviewing setback lines at least every ten years, however, may not be sufficient for effective shoreline protection as more frequent and extreme weather events occur and the expected accelerated rate of sea level rise over the next century.<sup>185</sup> Even reviewing setback line formulas every decade is an improvement from referring to original lines. As such, fixed setback lines may still protect against coastal erosion and sea level rise if provisions to reconsider the line are added to existing laws.

Fixed setback lines are appealing as a bright-line rule to treat neighbors equally and better align with the state's identified purpose for coastal management, but the current limitations are problematic. No state discussed in this article using a fixed setback line includes statutes or regulations to change the line like states using and reviewing floating setback lines. For example, the original state plane coordinates established in 1979 still apply in Alabama despite significant erosion since, so some areas of the CCL are now offshore and underwater without statutory provisions to change the setback line.

Specifically, development on Alabama's Dauphin Island remains especially vulnerable to sea level rise because the land has eroded landward of the CCL allowing virtually any construction to occur without a state permit.<sup>186</sup> Seawall construction in recent years exemplified this problem because the seawalls were not subject to the state permitting authority as they were landward

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<sup>182</sup> *What You Should Know About Erosion and Oceanfront Development*, N.C. ENVTL. QUALITY, <https://deq.nc.gov/about/divisions/coastal-management/coastal-management-oceanfront-shorelines/what-you-should-know-about-erosion-oceanfront-development> (last visited Aug. 16, 2019).

<sup>183</sup> FLA. STAT. § 161.053(2)(a).

<sup>184</sup> S.C. CODE ANN. § 48-39-285.

<sup>185</sup> NATIONAL CLIMATE ASSESSMENT, *supra* note 9.

<sup>186</sup> Davina L. Passeri et al., *Dynamic Modeling of Barrier Island Response to Hurricane Storm Surge Under Future Sea Level Rise*, 149 CLIMATIC CHANGE 413 (2018).



of the CCL.<sup>187</sup> The seawalls have already accelerated erosion, leaving little room for birds and nesting turtles and failing to protect structures from flooding and storm events.<sup>188</sup>

Similar to Alabama's lack of authority to update the CCL, Georgia's setback line from 1979 depended on the height of live, native trees and age of certain structures, and was not updated otherwise. Trees grew or were cut down since 1979, perhaps through permitted projects, yet no legal procedure existed to respond effectively to coastal erosion changes altering the jurisdictional line. Furthermore, the zig-zag result of the setback lines protected some unnecessary areas, like parking lots. Fortunately, Georgia is known for successful beach conservation efforts, so the problems associated with the established jurisdictional line did not significantly affect the shoreline and the state's purpose of protecting the sand-sharing system was met.<sup>189</sup> With Georgia's new fixed setback line of twenty-five feet in most areas, changes to effectively protecting the sand-sharing system ought to be noted to compare how different setback lines affect coastal resiliency.<sup>190</sup>

## V. CONCLUSION

Setback lines must be enforced to best promote resilient coasts in the face of an uncertain future. Enforcement is necessary when persons act in violation of their permit or when they act without any permit. In these seven states, all but Alabama apply various mechanisms of enforcement. Fines and misdemeanors are the most common mechanisms, but temporary restraining orders and nuisance are also used to enforce the respective legal provisions. In Alabama, the enforcement provisions of ACAMP were repealed in 1994.<sup>191</sup>

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<sup>187</sup> Federal authority for coastal construction begins at the mean high tide line. Dauphin Island had enough shoreline at the time of construction to classify the seawalls as retaining walls, which do not require a federal permit.

<sup>188</sup> William J. Neal et al., *Why Coastal Regulations Fail*, 156 OCEAN & COASTAL MGMT. 21 (2018).

<sup>189</sup> WILLIAM BOYD ET AL., COASTAL NATURE, COASTAL CULTURE: ENVIRONMENTAL HISTORIES ON THE GEORGIA COAST 6-7 (2018).

<sup>190</sup> As previously mentioned, the states examined in this study are intrinsically different so comparing the state setback lines to each other would be misguided. However, updates to setback lines in one state may be compared to previous protective measures to better assess effectiveness of those lines. Still, developing those variables for that comparative analysis is outside the scope of this research.

<sup>191</sup> ALA. ADMIN. CODE r. 335-8-1-.32.

Adaptive management is an appropriate regulatory tool for planning coastal development because it incorporates short- and long-term goals to mitigate sea level rise and coastal erosion through iterative decision-making.<sup>192</sup> Specifically, adaptive management techniques may encompass aspects of shore protection provisions in Florida and Virginia. Florida has multiple methods for establishing setback lines based on location, which better account for the uniqueness of the ecosystems.<sup>193</sup> While Florida is more localized, the Virginia Marine Resources Commission partners with VIMS to establish the coastal erosion rates using the best available data to determine the setback line. By partnering with academic institutions measuring shoreline changes analogous to VIMS, states can identify appropriate jurisdictional areas without such a strain on limited government resources. This relationship fits within the adaptive management model because it offers a method of decision-making with consistent monitoring and flexibility.

The potential next steps for research in this area are widespread since this is the first examination of shore protection laws in these seven states. Sea level rise affects more than the southeastern United States' Atlantic and Gulf beaches; coastal wetlands in estuarine systems are also impacted. Thus, an immediate next step could be to apply the same analytical structure to coastal wetlands. Coastal wetland erosion is not ocean-fronting. While perhaps unintuitive, erosion rates affected by sea level rise may actually be higher on the marsh and bay sides of islands than on the oceanfront.

Upon categorizing existing shore protection laws, future research may consider developing model laws featuring adaptive management techniques. Similarly, researchers may consider other innovative policy options to respond to dynamic shoreline changes. Rather than using a setback line based on physical ecological markers, for example, mapping locations of endangered or threatened species could behoove drawing the jurisdictional area. Finally, future laws could incorporate GIS mapping data to compare current coastal ecosystems and sea level rise predictions to develop a dynamic method for whether the state laws are directly and effectively protecting shorelines and coastal wetlands.

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<sup>192</sup> Klaus Hasselmann et al., *The Challenge of Long-Term Climate Change*, 302 SCIENCE 1923 (2003).

<sup>193</sup> *But see* Thomas K. Ruppert, *Eroding Long-Term Prospects for Florida's Beaches: Florida's Coastal Construction Control Line Program*, 1 SEA GRANT LAW & POL'Y J. 65 (2008), <http://nsglc.olemiss.edu/sglpj/Vol1No1/4Ruppert.pdf> (last visited Aug. 16, 2019).