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PRESERVING HAWAI'I'S BEACHES: REGULATING COASTAL ARMORING

As Hawai'i faces increasing sea level rise and coastal erosion, serious measures should be enacted to limit coastal armoring structures. This paper looks to the trajectories of coastal armoring prohibitions in Maine, North Carolina, and South Carolina as examples of states that have recognized the harmful effects of coastal armoring and are prioritizing coastal protection. Additionally, green infrastructure and nature-based solutions are considered as alternatives to hard coastal armoring within the context of protecting critical public infrastructure, such as roadways. In order to fulfill its constitutional mandate and protect Hawai'i's public trust resources, the Hawai'i legislature should enact stringent regulations on coastal armoring and prioritize preservation of Hawai'i's treasured beaches.

HAWAI'I'S BEACHES IN PERIL: CLIMATE CHANGE, EROSION AND SHORELINE HARDENING

Hawai'i's iconic beaches are vitally important ecologically, culturally, recreationally, and economically, yet scientists estimate that seventy percent of beaches on Kaua'i, O'ahu, and Maui are experiencing erosion.[1] Three principle events have been attributed to causing coastal erosion: "1) human interruption of natural sand movement and sand supply 2) high waves and currents leading to natural deficits in sand-supply, and 3) sea-level rise which drives the beach to reposition in a more landward location."[2] Although each of these three causes often "operate together to varying degrees,"[3] this paper is focused on the human induced impacts, principally the use of coastal armoring structures and devices.

Scientists have found that "[w]hen natural sand supply is impounded by a seawall or other structure, it inevitably leads to deterioration of the beach."[4] Twenty miles of O'ahu beaches are "backed by seawalls and other hardenings structures."[5] Of those backed by shoreline hardening structures, over five miles of beach "fronting those structures has already been completely eroded away."[6] Additionally, Kaua'i and Maui have each lost four miles of beach due to shoreline hardening structures.[7]

With increasing development along Hawai'i's coast combined with rising seas and coastal erosion, governmental entities are left with a difficult choice: allow coastal landowners to

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[1] USGS, *70 Percent of Beaches Eroding on Hawaiian Islands Kauai, Oahu, and Maui* (May 7, 2012) https://www.usgs.gov/news/70-percent-beaches-eroding-hawaiian-islands-kauai-oahu-and-maui.
[2] CHARLES FLETCHER, CHAPTER 9, BEACH EROSION AND LOSS http://www.soest.hawaii.edu/coasts/publications/shores/9Beach_erosion_FLETCHER-final.pdf.
[3] FLETCHER, *supra* note 2.
[4] FLETCHER, *supra* note 2.
[5] HAWAI'I CLIMATE CHANGE MITIGATION AND ADAPTATION COMM'N, HAWAI'I SEA LEVEL RISE VULNERABILITY AND ADAPTATION REPORT, 171, (State of Hawai'i Dep't of Land and Nat. Resources, Office of Conservation and Coastal Lands 2017).
[6] HAWAI'I CLIMATE CHANGE MITIGATION AND ADAPTATION COMM'N, *supra* note 5.
[7] HAWAI'I CLIMATE CHANGE MITIGATION AND ADAPTATION COMM'N, *supra* note 5.

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protect their private property with coastal armoring sturctures at the expense of the health of the beach or implement regulations that prioritize beach and coastal protection. Although it is not an easy choice, if Hawai‘i is to fulfill its constitutional mandate, limitations on coastal armoring will need to be put in place, otherwise the alarming trend of beach loss will only intensify.[8] As the Hawai‘i Sea Level Rise Vulnerability and Adaptation Report found, "beaches may be able to thrive, even as sea level rises, if their landward migration into upland sand deposits is not impeded by coastal structures."[9] As coastal erosion accelerates, both private property and public infrastructure – such as roadways – are at risk. In addition to private property, many of Hawai‘i's roadways are along the coast and face erosion. Tough decisions will be necessary to determine when it is absolutely necessary to allow for coastal erosion control structures to protect critical public infrastructure or when alternative measures, such as green infrastructure options should be considered. Proper planning and strong legislation are imperative for Hawai‘i to acknowledge the risks to public and private property, while ensuring effective management of our public trust resources. Recognizing scientific knowledge about the negative impacts of coastal armoring to beaches, combined with the Hawai‘i state constitutional mandate, the Hawai‘i legislature would be prudent to enact prohibitions on new coastal armoring structures, restrictions on repairs and replacements of lawfully existing coastal armoring structures, and place priorities on green infrastructure, nature based solutions, and relocation of critical public infrastructure on eroding coasts.

FULFILLING HAWAI‘I'S CONSTITUTIONAL MANDATE TO PROTECT PUBLIC TRUST RESOURCES

The Hawai‘i State Constitution mandates that the "State and its political subdivisions shall conserve and protect Hawai‘i's natural beauty and all natural resources."[10] Under Article XI, Section One, "All public natural resources are held in trust by the State for the benefit of the people."[11] In addition to constitutional provisions, the Hawai‘i Coastal Zone Management Act sets forth numerous coastal protection objectives and policies, including objectives to "Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources," "Protect beaches for public use and recreation," "Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources," and "Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources."[12]

Despite the constitutional and statutory directives regarding the state's obligations to protect and preserve Hawai‘i's beaches, our valued public trust resources are experiencing alarming erosion rates and beach loss, in large part due to coastal armoring. Coastal armoring has been a common response to erosion, however, "[a]rmoring a chronically eroding coast leads to beach loss."[13] On O‘ahu alone, "about 25 percent of sandy beach has been narrowed or been

[8] *See* HAWAI‘I CLIMATE CHANGE MITIGATION AND ADAPTATION COMM'N, *supra* note 5 ("Beaches fronting these areas of exposed development face a high risk of loss if widespread shoreline hardening is allowed rather than allowing beaches to migrate landward with sea level rise.").
[9] HAWAI‘I CLIMATE CHANGE MITIGATION AND ADAPTATION COMM'N, *supra* note 5 at 235.
[10] HAW. CONST. art. XI, § 1.
[11] HAW. CONST. art. XI, § 1.
[12] HAW. REV. STAT. § 205A-2.
[13] Charles H. Fletcher, et al., *Beach Loss Along Armored Shorelines on Oahu, Hawaiian Islands*, 13, 1, J. OF COASTAL RESEARCH, 209-15 (1997).

completely lost since 1949 as a result of artificial hardening of the shoreline."[14] As sea levels rise, the problem of coastal erosion is exasperated. Recognizing the harmful effects of coastal hardening on natural beach processes, states such as Maine, North Carolina, and South Carolina have implemented legislation restricting or prohibiting construction of coastal armoring structures. As Hawai'i pursues sea level rise adaptation, mitigation, and managed retreat plans, this paper looks to the trajectories of these three states for examples of potential pathways for Hawai'i to implement legislation that limits the use of coastal hardening structures and prioritizes beach protection.

LESSONS FROM MAINE, NORTH CAROLINA, AND SOUTH CAROLINA

Maine, North Carolina, and South Carolina have all prohibited coastal hardening structures, such as seawalls, in some fashion or another in an attempt to prevent erosion of their beaches. As Hawai'i faces many of these same challenges, the trajectories of Maine, North Carolina and South Carolina provide some guidance for implementing stronger coastal protection legislation in Hawai'i. Maine, North Carolina, and South Carolina, among other states, have enacted legislation recognizing the impacts of coastal hardening structures and implementing various restrictions on construction of new coastal armoring structures and devices and limits on repairs or replacements of existing structures and devices. With limited exceptions, Maine, North Carolina, and South Carolina prohibit construction of new coastal armoring structures and place stringent limitations of repairs of existing structures.

The legislatures in Maine, North Carolina, and South Carolina have each acknowledged the impact of coastal hardening structures on natural beach processes and recognized the need to protect their state's valuable beach and coastal resources. The Maine legislature has recognized that "[m]any of the sandy beaches and dunes along Maine's coastline are eroding, in part, due to a scientifically documented rise in relative sea level" and "attempts to prevent erosion and flooding through the construction or enlargement of seawalls harm the beach and dune system."[15] The North Carolina legislature declared "North Carolina's most valuable resources are its coastal lands and waters."[16] The legislature noted the increasing pressures facing the coastal areas, finding that "unless these pressures are controlled by coordinated management, the very features of the coast which make it economically, esthetically, and ecologically rich will be destroyed."[17] With this foresight, the legislature found "an immediate and pressing need exists to establish a comprehensive plan for the protection, preservation, orderly development, and management of the coastal area of North Carolina."[18] Likewise, the South Carolina legislature found "The use of armoring in the form of hard erosion control devices such as seawalls, bulkheads, and rip-rap to protect erosion-threatened structures adjacent to the beach has not proven effective."[19] The South Carolina legislature further elaborated that "[t]hese armoring devices have given a false sense of security to beachfront property owners. In reality, these hard

[14] CHARLES H. FLETCHER, ET AL., NATIONAL ASSESSMENT OF SHORELINE CHANGE IN THE HAWAIIAN ISLANDS, U.S. Geological Survey Open File Report 2011-1051 (2012) https://pubs.usgs.gov/of/2011/1051/pdf/ofr2011-1051_report_508.pdf.
[15] ME. CODE R. § 06-096-355.
[16] N.C. GEN. STAT. § 113A-102.
[17] N.C. GEN. STAT. § 113A-102.
[18] N.C. GEN. STAT. § 113A-102.
[19] S.C. CODE ANN. § 48-39-250 (d)(5).

structures, in many instances, have increased the vulnerability of beachfront property to damage from wind and waves while contributing to the deterioration and loss of the dry sand beach which is so important to the tourism industry."[20]

Maine regulations include a general prohibition on new seawalls, they encourage landowners to consider removing existing seawalls and implement other measures which lessen the negative impacts on coastal processes, while allowing for emergency exemptions within narrow parameters. Maine's Coastal Sand Dune Rules generally prohibit construction or new seawalls or similar structures and mandates specific requirements for exempted emergency actions and repairs or replacements of existing seawalls and similar structures.[21] Maine requires that "No new seawall or similar structure may be constructed. No existing seawall or similar structure may be altered or replaced except as provided below, and as allowed under Chapter 305, Permit By Rule and 38 M.R.S.A. §480-W."[22] Exemptions to the general prohibition allow granting of permits for replacing a seawall or "similar structure" of "different dimensions or in a different location that is farther landward if the department determines that the replacement structure would be less damaging to the coastal sand dune system, existing wildlife habitat and adjacent properties than replacing the existing structure with a structure of the same dimensions and in the same location."[23] The department "encourages landowners to consider removing a seawall or similar structure and covering the area with sand and dune vegetation, or replacing the structure in a more landward position to reduce its influence on the beach and sand dune system."[24] Maine Revised Statutes, Section 480-W allows for certain emergency exemptions to the general prohibition on seawall construction, including exemptions for emergency repairs to existing seawalls and similar structures.[25] After emergency repairs, an applicant may seek approval for "permit by rule" for replacing or repairing a seawall or similar structure that is "identical in all dimensions and location" and where specific standards are met, including avoiding disturbance of dune vegetation, prohibitions on movement of sand during certain months without written approval, provided that the replacement of a seawall does "not increase the height, length or thickness of the seawall beyond that which legally existed within the 24 months prior to the submission of the permit-by-rule notification."[26]

Long recognizing the harmful impacts of coastal hardening structures, North Carolina prohibits permanent erosion control structures, but provides for limited exceptions in instances where the structure was already in place before official legislation or where the applicant is seeking approval for a terminal groin. The North Carolina legislature formally enacted the erosion control structure ban in 2003, however, nearly two decades prior the North Carolina Coastal Resources Commission recommended "banning the construction of hard structures to protect buildings at the coast" with certain exemptions.[27] Thus, even before the official

[20] S.C. CODE ANN. § 48-39-250 (d)(5).
[21] ME. CODE R. § 06-096-355.
[22] ME. CODE R. § 06-096-355.
[23] ME. CODE R. § 06-096-355.
[24] ME. CODE R. § 06-096-355.
[25] 38 ME. REV. STAT. ANN. § 480-W.
[26] 38 ME. REV. STAT. ANN. § 480-W.
[27] Emily Jack, *Coastal Erosion and the Ban on Hard Structures*, https://www.ncpedia.org/anchor/coastal-erosion-and-ban-hard. *See also* 2011 N.C. Sess. Laws 387 ("Whereas, it has been the policy of the State of North Carolina since 1985, as stated in the Coastal Area Management Act and rules adopted pursuant to the act, to give preference

legislation in 2003, the shoreline hardening ban existed in practice since the commission's recommendation in 1985.[28] North Carolina General Statutes Section 113A-115.1 provides that "No person shall construct a permanent erosion control structure in an ocean shoreline."[29] For temporary erosion control structures, the Commission "shall not permit the construction of a temporary erosion control structure that consists of anything other than sandbags in an ocean shoreline."[30] Some specific exceptions apply, including exclusions for certain erosion control structures approved or constructed before defined dates.[31] For example, the prohibitions do not apply to permanent erosion control structures approved "pursuant to an exception set out in a rule adopted by the Commission prior to July 1, 2003;" "[a]ny permanent erosion control structure that was originally constructed prior to July 1, 1974, and that has since been in continuous use to protect an inlet that is maintained for navigation;" and "[a]ny terminal groin permitted pursuant to this section."[32] Additionally, the Commission may renew permits for erosion control structures which were originally "permitted pursuant to a variance" prior to July 1, 1995, provided that the Commission finds "(i) the structure is located adjacent to an intertidal marine rock outcropping designated by the State as a Natural Heritage Area pursuant to Part 42 of Article 2 of Chapter 143B of the General Statutes and (ii) the replacement structure will comply with all applicable laws and with all rules, other than the rule or rules with respect to which the Commission granted the variance, that are in effect at the time the structure is replaced."[33] Specific procedures are in place for applicants seeking approval of a permit for a terminal groin.[34]

Similar to Maine and North Carolina, South Carolina generally prohibits new coastal armoring structures and imposes strict criteria for repairs or replacement of existing coastal armoring structures. South Carolina Code Annotated Section 48-39-290 prohibits "new erosion control structures or devices . . . seaward of the setback line except to protect a public highway which existed on the effective date of this act."[35] Repairs or replacements to erosion control devices in existence on the date of the ordinance are subject to certain criteria set forth in South Carolina Code Annotated Section 48-39-290(2)(b).[36] New construction and reconstruction is prohibited seaward of the baseline, some exemptions apply,[37] including for "existing groins, which may be reconstructed, repaired, and maintained."[38] Construction of "[n]ew groins may be

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to nonstructural responses to erosion, including relocation of threatened structures, beach nourishment, inlet relocation, and the temporary use of sandbags for short-term stabilization.").

[28] Jack, *supra* note 27.

[29] N.C. GEN. STAT. § 113A-115.1(b). Erosion Control Structures are defined as "breakwater, bulkhead, groin, jetty, revetment, seawall, or any similar structure." N.C. GEN. STAT. § 113A-115.1(a)(1).

[30] N.C. GEN. STAT. § 113A-115.1(b).

[31] N.C. GEN. STAT. § 113A-115.1(b)(1)(2).

[32] N.C. GEN. STAT. § 113A-115.1 (b)(1)(2).

[33] N.C. GEN. STAT. § 113A-115.1 (c).

[34] *See* N.C. GEN. STAT. § 113A-115.1 (d) and (e).

[35] S.C. CODE ANN. § 48-39-290 (v)(2). "Erosion control structures or devices include:(a) seawall: a special type of retaining wall that is designed specifically to withstand normal wave forces; (b) bulkhead: a retaining wall designed to retain fill material but not to withstand wave forces on an exposed shoreline; (c) revetment: a sloping structure built along an escarpment or in front of a bulkhead to protect the shoreline or bulkhead from erosion." N.C. GEN. STAT. § 48-39-270.

[36] S.C. CODE ANN. § 48-39-290 (2)(b).

[37] *See also* S.C. CODE ANN. § 48-39-300.

[38] S.C. CODE ANN. § 48-39-290 (a)(8).

allowed only on beaches that have high erosion rates with erosion threatening existing development or public parks."[39] Additionally, whether reconstructing an existing groin or constructing a new groin, such actions may only be taken "in furtherance of an ongoing beach renourishment effort which meets the criteria set forth in regulations promulgated by the department" and in accordance with certain criteria, such as instituting a monitoring project and analysis that "the groin will not cause a detrimental effect on adjacent or downdrift areas."[40] Additionally, "removal of an erosion control structure or a device protecting a public highway which existed on the effective date of Act 634 of 1988" is not required.[41]

PROTECTING PUBLIC HIGHWAYS: ALTERNATIVES TO COASTAL ARMORING

As critical public infrastructure along the coast, such as roadways and highways, are subject to increasing erosion, any legislation implementing restrictions on shoreline hardening structures must consider whether to allow coastal armoring to protect critical public infrastructure or what alternatives should be pursued. Although some states, such as South Carolina, exempt protection of public highways from the general prohibition on coastal erosion control structures,[42] the Hawai'i legislature should consider hard coastal armoring structures as a last resort to protecting critical public infrastructure. Instead, measures such as green infrastructure options, relocation, and beach nourishment should be prioritized whenever feasible.

States such as Oregon have recognized the importance of "think[ing] outside the box" in terms of developing solutions to eroding highways along the coast.[43] The Oregon Department of Transportation conducted a study exploring the use of green infrastructure options instead of traditional hard coastal armoring.[44] The study found "[n]ature-based design options have the potential to provide effective protection with the benefits of responding dynamically to coastal processes and being more natural in appearance."[45] Likewise, the U.S. Department of Transportation Federal Highway Administration has developed an implementation guide for "Nature-Based Solutions for Coastal Highway Resilience."[46] The guide notes that "Nature-based solutions often serve as alternatives to, or ecological enhancements of, traditional shoreline stabilization and infrastructure protection techniques."[47] The study highlights alternatives to traditional hard coastal armoring, including nature-based solutions such as beach nourishment and dune restoration.[48] Similarly, the "Highways in the Coastal Environment" report by the U.S. Department of Transportation Federal Highway Administration notes that relocation of roads is

[39] S.C. CODE ANN. § 48-39-290 (a)(8).
[40] S.C. CODE ANN. § 48-39-290 (a)(8).
[41] S.C. CODE ANN. § 48-39-290 (2)(c).
[42] S.C. CODE ANN. § 48-39-290 (v)(2).
[43] OREGON DEP'T OF TRANSP., GREEN INFRASTRUCTURE TECHNIQUES FOR RESILIENCE OF THE OREGON COAST HIGHWAY, 6, https://www.oregon.gov/ODOT/Programs/TDD%20Documents/Green-Infrastructure-Study.pdf.
[44] OREGON DEP'T OF TRANSP., *supra* note 43.
[45] OREGON DEP'T OF TRANSP., *supra* note 43 at 1.
[46] U.S. DEP'T OF TRANSP. FED. HIGHWAY ADMIN., NATURE-BASED SOLUTIONS FOR COASTAL HIGHWAY RESILIENCE: AN IMPLEMENTATION GUIDE (2019) (hereinafter "NATURE-BASED SOLUTIONS").
[47] NATURE-BASED SOLUTIONS, *supra* note 46 at 6.
[48] NATURE-BASED SOLUTIONS, *supra* note 46 at 21-24.

one option "in response to coastal erosion."[49] The report explains that "[c]oastal roads traverse bays, estuaries, beaches, dunes and bluffs."[50] Moreover, the U.S. Department of Transportation Federal Highway Administration acknowledges that "[t]hese are some of the most unique and treasured habitats for humans as well as a variety of plants and animals. The list of endangered species requiring these coastal habitats for survival includes numerous sea turtles, birds, mammals, rodents, amphibians and fishes."[51] Studies such as these can serve as a basis for shaping and implementing alternative solutions to coastal hardening as a response to protecting critical public infrastructure.

RECOMMENDATIONS FOR HAWAIʻI LEGISLATION AIMED AT RESTRICTING NEW COASTAL ARMORING STRUCTURES

States such as Maine, North Carolina, and South Carolina have acknowledged the harmful effects of coastal armoring to natural coastal processes and taken serious measures to prevent increased use of armoring. Similar to the measures taken in Maine, North Carolina, and South Carolina, the Hawaiʻi legislature should enact prohibitions on new coastal erosion control structures, with specific limited exceptions to account for repairs to lawfully existing coastal armoring structures and protection of existing critical public infrastructure, such as public highways, when other options are infeasible. Even in such cases, consideration should be given to green infrastructure options, such as alternatives discussed by the Oregon Department of Transportation and the U.S. Department of Transportation Federal Highway Administration.

In 2020, the Hawaiʻi legislature took steps in the right direction when they considered legislation such as Senate Bill (SB) 2060 and SB 2381. SB 2060, relating to Coastal Zone Management, calls for prohibiting "construction of private shoreline hardening structures, including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities"[52] and calls for minimizing "construction of public shoreline hardening structures, including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interferes with existing recreational and waterline activities."[53] These provisions are critical in moving towards stringent statewide policies favoring beach protection, however, the proposed bill includes "hardship" variance language that should be revised in order to fulfill the intent of the bill. The hardship language should be modified to eliminate potential ambiguities and make it clear that a landowner may not receive a variance for a shoreline structure on a sand beach. Moreover, the language regarding "minimizing" public shoreline hardening structures should be strengthened to emphasize that shoreline hardening structures to protect critical public infrastructure should only be utilized when other options, such as green infrastructure or relocation, are not feasible. SB 2381 proposes adjusting shoreline setback requirements by means

[49] U.S. DEP'T OF TRANSP. FED. HIGHWAY ADMIN., HIGHWAYS IN THE COASTAL ENV'T, Second Edition (2008) 15, https://www.fhwa.dot.gov/engineering/hydraulics/pubs/07096/07096.pdf (hereinafter HIGHWAYS IN THE COASTAL ENV'T).
[50] HIGHWAYS IN THE COASTAL ENV'T, *supra* note 49.
[51] HIGHWAYS IN THE COASTAL ENV'T, *supra* note 49.
[52] S.B. 2060, 30th Leg. (Haw. 2020).
[53] S.B. 2060, 30th Leg. (Haw. 2020).

of taking sea level rise into consideration.[54] Combined with other legislation aimed at regulating shoreline hardening structures, SB 2381 plays an important role in ensuring adequate shoreline setback requirements in a time of rising seas and increased coastal erosion. Both of these bills are a strong step in the right direction, however, further legislation aimed at increasing protection for Hawai‘i’s public beaches is critical to ensuring our beaches persist as sea levels rise and coastal erosion exacerbates. Creating a stringent statewide policy for regulating coastal armoring structures and providing support for alternative infrastructure options would allow Hawai‘i to implement a comprehensive plan that upholds the Hawai‘i State Constitutional mandate and ensures protection and preservation of our valued public trust resources.

[54] S.B. 2381, 30th Leg. (Haw. 2020) (increasing the shoreline setback line to not less than forty feet, versus the current twenty foot setback requirement).