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Coastal Adaptation Policy Brief

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Seawalls

Introduction

A seawall is a shoreline protection structure engineered to protect against encroaching seas. Seawalls are used to protect built infrastructure, directly or indirectly, by absorbing wave impact, reducing erosion, and serving as retaining walls which keep cliff-sides and posterior fill from eroding with each storm.[1] They are typically built parallel to the shoreline with vertical, concave, or stepped faces and usually consist of concrete, wood, steel, or a mixture of these materials.[2] Depending on their designated purposes, seawalls have been built to protect individual properties or larger communities from coastal flooding and storm surge.[3]

Seawalls are potentially suitable protective structures where local governments want to protect areas in the short term.[4] Particularly, seawalls might be suitable for areas that are already developed, such as those with a high amount of valuable infrastructure areas, and areas that are not adjacent to beaches. Any local governments contemplating building seawalls should weigh the private (e.g., cost, lifespan, effectiveness) and public (e.g., aesthetics, access, beach space, sand supply) effects of these structures versus the expected benefits they will provide.

Tradeoffs

Seawalls protect discrete areas in the short term. They can protect public and private investments in buildings, homes, and other infrastructure from storm surge and flooding. Seawalls also serve local governments' interests by protecting property tax revenue generated by some of that community's most expensive homes. One possible advantage seawalls might have over competing protective structures is that they often require smaller footprints to construct than comparable protective structures, such as riprap or revetments.[5]

Constructing a durable seawall requires careful planning and engineering, which can increase capital and maintenance costs.[6] Seawalls must be designed to effectively address wave overtopping, undermining, outflanking, and extreme impacts during the largest storm and flood events.[7] Wave overtopping and undermining are particularly concerning, as seawater intrusion behind a seawall can often wash away the supportive fill and create a "weak link" in the seawall.[8] This phenomenon often occurs in areas where seawalls have been permitted on an ad-hoc basis, thereby prompting neighboring properties to armor in kind in order to avoid patchwork, risk-prone seawalls.[9] In areas where seawall protection is deemed necessary, communal and uniform planning are necessary to alleviate some of these risks.[10]

In addition to the engineering concerns, seawall development also prompts issues of public availability and access to California's beaches. Seawalls impair beaches

1 Gary Griggs et al., Living with the Changing California Coast 117 (Gary Griggs et al. eds., 2005).

2 *Id.*

3 U.S. Army Corps of Engineers, Coastal Risk Reduction and Resilience: Using the Full Array of Measures 6-7 (2013).

4 Griggs et al., *supra* note 1, at 123 ("There is no such thing as permanent protection, and there is no guarantee today that a seawall permit will be approved.").

5 Cal. Coastal Comm'n, Staff Report Addendum for F8B CDP Application Number 2-11-009 (City of Pacifica Shoreline Protection) 26 (2014), *available at* https://documents.coastal.ca.gov/reports/2014/7/F8b-7-2014.pdf ("A seawall is often preferable to a riprap revetment because it can occupy a smaller area of beach.").

6 Molly Loughney Melius & Margaret R. Caldwell, 2015 California Coastal Armoring Report: Managing Coastal Armoring and Climate Change Adaptation in the 21st Century 8 (2015).

7 Griggs et al., *supra* note 1, at 111.

8 *Id.* at 123.

9 Jesse Reiblich & Eric H. Hartge, *The Forty-Year-Old Statute: Unintended Consequences of the Coastal Act and How They Might Be Redressed*, 36 Stan. Envtl. L.J. 63, 85 (2016) (explaining how formation of a GHAD can help avoid this patchwork of armoring).

10 Griggs et al., *supra* note 1, at 123.

through "passive erosion"—i.e. they prevent the beach from migrating inland as seas rise and erosive events occur.[11] This effect, in combination with impoundment, sand supply loss,[12] and rising sea levels, will gradually narrow public beaches until they disappear completely.[13] The physical barrier of a seawall also diminishes accessible entry points for non-coastal residents.[14] These concerns represent the tradeoffs between protection of upland property and protection of public uses of coastal lands.[15]

Legal Considerations

Constructing a protective seawall requires a coastal development permit (CDP), except in the limited circumstances where an emergency necessitates protection in the face of a disaster.[16] The California Coastal Commission (CCC) retains jurisdiction over most areas where a seawall would be feasible.[17] Accordingly, an applicant would need to seek a CDP directly from the Commission.[18]

The Coastal Act allows the construction of protective structures to protect existing structures, and it requires that new development be built so as not to need protective structures, such as seawalls.[19] Even when seawalls are permitted, they must be built so that they are the least environmentally damaging, feasible alternative available.[20] Furthermore, the CCC might require certain mitigating conditions in exchange for permitting the construction of a protective seawall.[21] Examples of these conditions have included materials and discharge construction plans, sensitive habitat mitigation, and temporal expirations of permits to reconsider their effects at a later date, amongst others.[22]

Examples

California's coastline features over 100 miles of seawalls and other protective structures.[23] In many southern cities, individual seawalls have proliferated along the coastline in population-dense urban areas. Additionally, large-scale seawalls, such as the O'Shaughnessy Seawall completed in 1928 in Ocean Beach, have been established for community- and road-building purposes.[24]

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11 Melius & Caldwell, *supra* note 6, at 8.

12 Impoundment loss occurs when cliff or beach sand that would have supplied the beach through erosion becomes impounded behind a seawall, leading to increased rates of erosion on downdrift properties. Melius and Caldwell, *supra* note 6, at 8; Griggs et al., *supra* note 1, at 134 ("This has also been called the peninsula effect because the armored area becomes a peninsula over time.").

13 Melius and Caldwell, *supra* note 6, at 8.

14 *Id.* at 9.

15 Griggs et al., *supra* note 1, at 133-4.

16 Cal. Pub. Res. Code § 30600(a)-(e).

17 Cal. Pub. Res. Code § 30601.

18 Cal. Pub. Res. Code § 30601.

19 Cal. Pub. Res. Code §§ 30235, 30253(b); Cal. Coastal Comm'n, Sea Level Rise Policy Guidance 165 (2015) (explaining that 30235 and 30253 to "evince a broad legislative intent to allow shoreline protection for development that was in existence when the Coastal Act was passed, but avoid such protective structures for new development now subject to the Act.").

20 Cal. Pub. Res. Code § 30235; This aligns with the California Environmental Quality Act's provisions requiring feasible mitigation measures to be incorporated into all state-permitted construction activities to substantially lessen the adverse effects said project would have on the environment. Cal. Pub. Res. Code §§ 21000-06.

21 The *Nollan* and *Dolan* cases comprise the two-prong test for determining whether these conditions are constitutionally permissible. Nollan v. California Coastal Commission, 483 U.S. 825, 837 (1987) (requiring a nexus between the burdens imposed by the development and the permit condition); Dolan v. City of Tigard, 512 U.S. 374, 391 (1994) (requiring a rough proportionality between the conditions and the development's impact).

22 California Coastal Commission, Summary of Staff Recommendation Application Number 5-06-160 (2006), *available at* https://documents.coastal.ca.gov/reports/2006/11/Th15c-11-2006.pdf.

23 Gary Griggs, *The Effects of Armoring Shorelines – The California Experience, in* Puget Sound Shorelines and the Impacts of Armoring – Proceedings of a State of the Science Workshop 77, 77 (H. Shipman et al. eds., 2010).

24 *See generally* Bill Mclaughlin, A History of Coastal Erosion at Ocean Beach, Surfrider Foundation San Francisco Chapter (2012).

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