

Selling New Jersey Landowners on Living Shorelines as the Superior Method for Coastline Protection

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Executive Summary: Living Shorelines (LS) refer to the combined use of man-made and natural materials to build a resilient and ecologically vibrant shore. LS are an emerging alternative to hardened shorelines (HS), which employ engineered structures to reinforce eroding shorelines. LS better protect coastlines against erosion and flooding, which are of increasing concern due to climate change and rising sea levels. New Jersey (NJ) is a leader in LS policy, but lack of knowledge regarding these structures hinders further LS implementation. Progress has been made to reduce regulatory hurdles for LS projects. However, decision-making power rests with many private property owners (PO) who default to familiar approaches, like HS. Therefore, we advise the NJ state legislature to encourage LS development by appropriating funds to the NJ Department of Environmental Protection or other relevant agencies to conduct an awareness campaign in key coastal communities. Additionally, PO can be incentivized to convert from HS to LS by restructuring the existing NJ Shoreline Protection Fund. This proactive intervention will provide environmental benefits, in addition to protecting the coastline of NJ.

I. The Jersey Shore is under threat

Rising sea levels and increasing storm intensity driven by climate change threaten shorelines worldwide, and the Jersey coast is no exception. New Jersey (NJ) is uniquely vulnerable to the ocean's encroachment, with rates of sea level rise higher than the global average due to its underlying geology (Kopp et al. 2019). The typical response to these threats is the construction of hardened

shorelines (HS), which employ engineered structures ('harder' techniques in **Figure 1**) such as seawalls to reinforce eroding shorelines. NJ's coast is highly developed, with only 31 miles (~23.8%) of ocean-front land lacking hard infrastructure (Hilke et al. 2020). HS have significant ecological and financial downsides, but property owners (PO) are often unaware of viable alternatives. HS can be less effective than more natural solutions, known as

living shorelines (LS), which can overcome the drawbacks of HS. LS use a combination of engineered and natural materials (*i.e.*, concrete and marsh grasses) to build a resilient and ecologically vibrant shore. LS can inexpensively and effectively protect shorelines exposed to low and moderate wave energy, while reducing pollution and providing habitat for wildlife like herons, diamondback terrapins, and commercially important crabs and fish (NJDEP, 2019 and Isdell et al. 2021). Recognizing their potential, the New Jersey Department of Environmental Protection (NJDEP) made sweeping regulatory changes to

increase the development of LS projects; this included establishing the state General Permit 24 (NJAC 7:7-6.24) in 2015 to authorize LS projects that create, restore, or enhance habitat. Although regulatory hurdles have been lowered, uptake of LS technology remains low. The decision to build LS largely rests with PO, as ~70% of coastal property nationwide is under private control (Hilke et al. 2020). LS remain a little-known option among this key group of stakeholders. In this policy memo, we present options that leverage psychology to help private PO make the most effective choices for how to protect themselves and their communities.

HOW GREEN OR GRAY SHOULD YOUR SHORELINE SOLUTION BE?

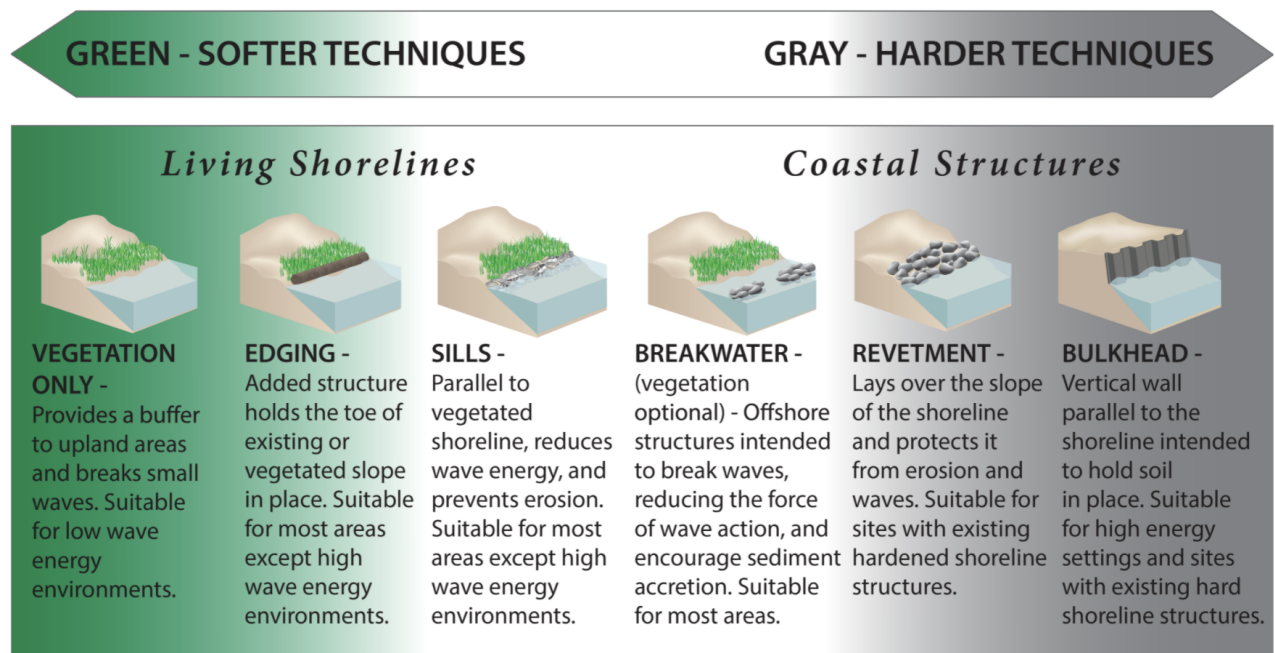


Figure 1: Solutions to protect shorelines lie on a spectrum of ‘harder’ (HS) and ‘softer’ techniques (LS) (adapted from NOAA Living Shorelines).

II. Adapting to rising seas

As sea levels rise, coastal development must either retreat away from the sea or adopt measures to preserve existing coastline. To slow or stop this encroachment from rising sea levels PO can choose from a spectrum of ‘softer’ techniques that are dynamic (such as LS) and ‘harder’ techniques (like HS) that are static (**Figure 1**).

Although HS may be the best option in highly developed coastal cities with waterfront infrastructure like wharfs and piers, HS are

expensive and poorly suited for protecting many smaller coastal communities. A study by Smith et al. (2017) compared communities throughout North Carolina (NC) employing HS (60%) and LS (40%) technologies following hurricanes Irene (2011) and Arthur (2014), and found:

- HS required 4x higher annual maintenance costs than LS.
- HS PO reported post-hurricane repair costs 2x that of similar LS owners.

- 93% of total hurricane damage was endured by properties that implemented HS.

These data show that NC residents may have been better served with LS, rather than the HS they relied upon. Despite this underperformance, the installation of HS in affected regions increased by 3.5% during the 5-year study period between these hurricanes (Smith et al. 2017). NJ residents should be informed of a more effective alternative to HS and empowered to choose the most prudent option for their properties.

III. Barriers and opportunities for LS

i. Lack of awareness

NJ state regulations already favor LS over HS (*i.e.*, NJ Coastal Zone Management Rules 7:7-9.44(d)). Additionally, the New Jersey Shore Protection Fund (NJSPF) is a cost-share program that financially assists municipalities and counties in restoring, protecting, and stabilizing the NJ shoreline, which are functions of LS (NJSA 13:19-16). Despite making significant inroads with policymakers, LS are still not commonly known as a practical option for coastal development. Private PO remain the group most in need of persuasion, especially because decisions in protecting their coastal properties can impact inland residents during intense storms.

There appears to be a gap between the values of PO and their shoreline protection decisions. Most waterfront PO acknowledge climate change and value coastal wetlands, yet build HS, regardless (Gittman et al. 2021); however, they may prefer LS once they are educated about the ecological benefits of LS, including the ability to adapt to rising sea levels. To best serve these coastal populations, it is important to understand the psychology that is driving this mismatch between values and behavior.

ii. Psychology and Groupthink

Human psychology has hindered the transition to LS, but it can also be leveraged to expand them. Individuals may be deterred from considering LS by a cognitive bias based on the incorrect notion that HS are less expensive and more durable than LS (Smith et al. 2020), despite lived experiences

that would undermine this assumption (Smith et al. 2017). In addition, leaders in studied communities perpetuated incorrect assumptions (Rawat et al. 2021), so broad education about the harsh realities of HS could help persuade stakeholders to choose LS instead.

Since people are predisposed to in-group behavior, groupthink can potentially be leveraged to promote widespread use of LS. PO prefer whatever shoreline stabilization method their neighbor employs (Gittman et al. 2021). Therefore, policies that encourage individual owners to build LS can snowball into broader community acceptance and statewide building of LS.

iii. Finances

Since the majority (76%) of the NJ coast has already been developed with some form of hard infrastructure (Hilke et al. 2020), a successful expansion of LS will require converting HS to LS. Financial incentives would be an effective motivator for individuals to make this switch. When faced with the prospect of rebuilding a damaged HS, only 18% of PO were willing to transition to LS; however, when offered a modest economic incentive (10% cost-share), the number increased to 43%, and was even higher among newer residents (Scyphers et al. 2020).

Cost-sharing is an arrangement where individual PO pay a specified percentage of their building cost and a government entity covers the remaining portion. This method is especially effective on individuals who perceive habitat loss, environmental degradation, and climate change as major threats to their community (Scyphers et al. 2020). A bill creating a federal cost-share program has been introduced in the US House of Representatives but has seen no further action (Living Shorelines Act, 2021). Successful state level cost-sharing programs are already in effect in Maryland (MD), Virginia (VA), and NC (MD Department of Natural Resources 2013, Scyphers et al. 2020, and NC Coastal Federation 2021). NJ currently has a state-administered cost-share program, the NJSPF, which does not explicitly recommend the building of LS. As such, they are often used to build the familiar HS (NJDEP 2020).

IV. Policy options

i. Option 1: Inaction

The NJ state legislature may delay further policy action in promoting the construction of LS. However, without intervention, PO would likely continue to build HS structures by default. These static structures are not responsive to the changing conditions; this contrasts with LS, which are capable of some degree of self-repair and can grow to keep pace with sea level rise.

Advantages:

Abdicating the opportunity to encourage LS at the state-level will conserve state resources. If a federal cost-share program is passed, such as the Living Shorelines Act, then the state can rely on federal resources rather than their own.

Disadvantages:

Due to the lack of legislative action, it is unlikely that a federal cost-share program will exist soon. NJ coastal communities will be in harm's way as global sea level is projected to rise another 17-33 inches by 2100 (Oppenheimer et al. 2019). Ignoring its encroachment is not a no-cost proposition: significant amounts of money have already been spent by NJ to facilitate a retreat from the shoreline, including \$273 million towards buying out flood susceptible homes after Hurricane Sandy (FEMA 2021). Moreover, since the 1980s, NJ and the Army Corp of Engineers have spent more than \$2 billion dumping sand deposits to fortify the state's beaches (Lewis 2021). As sea levels continue to rise, governments are responding with measures that are costly and vary in effectiveness.

ii. Option 2: Promote an awareness campaign

An awareness campaign would accelerate the implementation of LS structures by 1) raising awareness about this option, and 2) combating misperception about both LS and HS. Previously discussed studies showed that PO hold concerns about climate change and already believe in the importance of conservation. However, there is a huge disconnect in the manner they go about protecting their homes. Educational seminars could prove beneficial in raising awareness and

correcting misperceptions about LS. Specifically, reaching out to realtors, PO associations, service providers, and other trusted information sources could help PO see the value of LS.

This awareness campaign can be modeled after similar environmental campaigns such as Smokey the Bear and wildfire prevention. If specific communities who would most benefit from LS are identified, targeted ads such as billboards and flyers can be posted. Aerial advertisements can be flown over beaches during the summer, exposing thousands of beachgoers to the term "living shoreline" and directing them to resources on the NJDEP website.

Advantages:

Raising awareness would dismantle the hurdles preventing LS expansion: 1) some PO are unaware of what LS are, and 2) other PO have misconceptions about the cost-benefits of LS vs. HS. With increased awareness, PO will have the power to seek LS solutions for their properties. Only a fraction of PO needs to be reached to gain momentum and leverage groupthink, as PO are heavily influenced by their neighbors when choosing a shoreline stabilization method (Gittman et al. 2021 and Scyphers et al. 2020).

Disadvantages:

Awareness campaigns can be costly and ineffective unless paired with financial incentives. Educational seminars may not be well attended and finding LS advocates could prove challenging. Funding for these outlets would require the legislature shifting money from current programs or the passage of new appropriations. The development and rollout of any awareness campaign would need to be dictated to a specified state agency.

iii. Option 3: Expand cost-share programs

Expanding existing cost-share programs could incentivize PO to choose LS. A PO's willingness to employ LS increased from 25% to 43%, depending on the duration of their property ownership, when offered a modest financial incentive (Scyphers et al. 2020).

One way to implement this option is by amending the NJSPF to specifically promote LS and to allow

individual PO to access funds. This Fund currently provides cost-sharing grants to municipalities and counties for the development of seawalls, ecosystem restoration, and other coastal management infrastructure projects. Grantees can receive up to 75% of their project's funding from the state of NJ (NJDEP 2020). Extending this program's eligibility to individuals and PO groups would mirror cost-sharing incentives already implemented with success in other states to promote LS.

Advantages:

Using an existing funding structure makes implementing a cost-share program easier than the creation of new ones. MD, VA, and NC have already incorporated cost-share programs with positive results (Hilke et al. 2020, Scyphers et al. 2020, and NC Coastal Federation 2021). Proactive efforts to adapt to climate change will have long-term benefits in mitigating the financial burden and human toll of climate disasters.

Disadvantages:

Expanding the NJSPF to individuals would be costly to the state government and rules for the program may hinder LS adoption. The current \$25 million

yearly funding for the NJSPF may not be sufficient to accommodate additional project costs in the short-term. The NJSPF requires projects to be accessible to the public, possibly deterring individuals from adopting LS on private land. Therefore, the NJ legislature would need to increase NJSPF funding and change public access rules to effectively incentivize LS adoption.

V. Final recommendation

We strongly recommend ***Options 2 and 3: Promote an awareness campaign and expand cost-share programs.*** NJ could benefit from implementing both policy options to combat sea level rise, provide habitat, and overcome the lack of awareness and financial barriers to building LS. The proliferation of LS structures would reduce cognitive biases against them. There is precedent for the creation of cost-sharing programs, as other states utilize them to promote LS building (Hilke et al. 2020). A short-term financial investment by the NJ legislature can yield long-term savings for both the state and private PO in costs associated with storm damage and adaptation. Awareness campaigns, coupled with a financial cost-sharing program, will incentivize individual PO to build LS structures statewide.

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Disclaimer

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