Bridging Policy and Public Perception: Effective Communication of Shoreline Armoring Trade-Offs in Coastal Communities

Prepared by:

Allison Morgan, M.M.A

Washington Sea Grant Hershman Fellow

PUGET SOUND INSTITUTE

UNIVERSITY of WASHINGTON

October 2025

Acknowledgements

This project has been funded wholly or in part by the United States Environmental Protection Agency under agreement CE-01J97401 through the Puget Sound Partnership. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency or the Puget Sound Partnership, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Sincere gratitude is extended to Aimee Kinney, Marielle Kanojia, and Kyle Clifton for their invaluable technical guidance and steadfast support throughout this research. I deeply appreciate the commitment of the Shore Friendly Practitioners, whose nuanced expertise and lived experience continuously bridge the gap between complex policy and effective, trust-building outreach. I would also like to thank the Puget Sound shoreline residents who generously shared their perspectives.

Contents

1.Introduction:

This paper presents a critical analysis of key reports that explore the barriers, opportunities, and communication strategies associated with shoreline armoring and sea level rise in Puget Sound. While the emphasis of this paper is on engagement, it is essential to acknowledge that behavior change, related to shoreline armoring, stems from a complex constellation of drivers. This includes incentives, regulatory pressures, and reductions in procedural friction (and, in some contexts, market dynamics), in addition to outreach-based efforts. Shoreline armoring, structures such as seawalls, bulkheads, and revetments, have long been used to protect coastal properties in Puget Sound, though not always in response to actual erosion risks. The *Marine Shoreline Design Guidelines* (Johannessen et al. 2014) identifies a pattern in shoreline development where bulkheads and other forms of hard armoring were often installed for landscaping or other purposes instead of demonstrated erosion risk, e.g. a property owner putting in a bulkhead as a retaining wall so that they could fill behind it and make a sloped yard level. This has led to instances where shoreline armoring was implemented on properties that, due to their physical characteristics, would not otherwise be subject to significant erosion. This could be an example of an indirect psychological impact related to future risks. Consequently, these structures may have provided little protective function while contributing to ecological degradation (Johannessen et al., 2014).

Where erosion is a challenge, hard defensive structures may offer short-term solutions to immediate environmental threats and safety concerns, but they also introduce complex trade-offs that affect not only property owners but also the broader ecological and social/cultural landscapes of the region. The impacts of shoreline armoring extend beyond the immediate footprint of structures by influencing sediment transport, marine habitat health, public access to beaches, and community resilience to climate change.

Regional and state agencies have recently increased their focus on shoreline management as sea level rise and coastal flooding risks become more pronounced. Forecasts for Puget Sound anticipate increased frequency of extreme water level events and pressure on both public infrastructure and private properties (Miller et al., 2022; Johannessen & Maverick, 2020; Cascadia Consulting Group, 2021). In response to these growing threats, programs such as the Puget Sound Marine & Nearshore Grant Program and the Habitat Strategic Initiative Lead, led by the Washington Department of Fish and Wildlife and the Washington State Department of Natural Resources, have supported development of an incentive program to reduce the use of traditional hard shoreline armoring as homeowners respond to these increased threats. *Shore Friendly* promotes and funds nature-based alternatives that aim to protect private property while enhancing shoreline ecological function and resilience (Habitat Strategic Initiative 2021; WDFW 2025). As government agencies, non-profit organizations, and community groups beyond Shore Friendly become increasingly engaged in shoreline management and climate adaptation, the lessons learned from Shore Friendly's communication strategies provide valuable guidance for designing effective, inclusive, and trust-building outreach efforts.

2. Analysis Purpose and Approach

2.1 Best Practices Example: Shore Friendly Program

Shore Friendly is a program that provides shoreline property owners with educational resources, site-specific technical assistance, and financial incentives to encourage the voluntary removal of existing shoreline armoring or the adoption of natural stabilization alternatives. Some of the core goals of these programs are to educate and inspire residents while using incentives to make the process of shoreline protection more approachable and streamlined (Shore Friendly 2015). Shore Friendly

programs employ trained personnel and serve as an example of current best practices for effective communication regarding shoreline armoring. Their communication strategy is based on a social marketing strategy developed by Colehour + Cohen, Applied Research Northwest, Social Marketing Services, Futurewise, and Coastal Geologic Services on behalf of the Marine and Nearshore Grant Program (Colehour + Cohen et al. 2014a). Social marketing is "the discipline of marketing that focuses on developing a strategic marketing mix to influence behavior change for sustainable, healthy, and equitable communities." (EPA 2025). Practitioners utilize social marketing in an effort to reduce barriers and ensure that desired outcomes are achieved (EPA, 2025). The social marketing technique has been utilized since 1971 and relies primarily on voluntary behaviors. Social marketing is used to help develop, or co-develop, and implement new sustainable social norms in conjunction with creating and enforcing laws or policies.

Shore Friendly offers personalized support through site visits, recommendations that align with property owners' unique needs and interests, and financial and technical support for implementing projects. The program uses a mix of communication tools, including digital and in-person engagement, workshops, webinars, and participant testimonials to showcase the benefits of alternative stabilization techniques like native vegetation planting, drainage management, and beach nourishment. By highlighting successful case studies and providing visual examples of natural shorelines, Shore Friendly helps demystify beach restoration practices and supports informed decision-making among coastal residents. Shore Friendly's communication strategy is grounded in ongoing feedback, ranging from surveys of waterfront residents and program participants to longer and more collaborative efforts, such as informal knowledge exchanges. Shore Friendly has historically refined its program offerings based on survey results, demonstrating best practices by tailoring services to the needs of local residents. The implementation of these strategies highlights the best practices coming from Shore Friendly programs, which are at the forefront of effective shoreline armoring communication and provide vital support for navigating complex regulatory processes.

There are currently eight Shore Friendly programs serving each of the 12 Puget Sound counties and one Tribal Reservation. The Northwest Straits Foundation's program covers six counties; in some areas, they work with local partners like the Friends of the San Juans. Other local Shore Friendly programs are implemented by county departments or conservation districts. The Swinomish Indian Tribal Community operates a program for their Reservation. Each local program is tailored to regional needs and priorities; some focus on preventing the installation of new shoreline armoring on unarmored properties, while others emphasize encouraging the voluntary removal of existing armor. Outreach efforts are also applied to varying degrees across counties with Shore Friendly programs, tailored to regional needs and priorities. The Shore Friendly website also offers a Resources in Your Area page, providing users with localized information and guidance. A summary of Shore Friendly program development and evolution can be found in Kinney (2019) and Kinney, Francis, and Rice (2016).

2.2 Need for Additional Communication Approaches

Local Shore Friendly programs typically use a variety of communication channels to convey information about place-based shoreline management options (Colehour + Cohen et al., 2014a; Kuehne et al., 2014). These strategies often aim to present the ecological, social, and economic impacts of different approaches, such as hard armoring, soft stabilization techniques, and sea level rise adaptation measures (Miller et al., 2022). The complexity of the subject matter, coupled with diverse stakeholder interests and varying levels of environmental knowledge, can create significant communication challenges. Shore Friendly has been remarkably effective in navigating these challenges and modeling strong communication practices, though there remains room for continued growth and refinement, particularly in relation to sea level rise response options.

The rise of sea level was not directly addressed in the initial development of the Shore Friendly program but is now emerging as an issue that will require additional communication strategies, particularly as psychological and sociological barriers remain ever-present. Shore Friendly is already laying important groundwork in this area. Consideration and incorporation of social science research will help ensure that messaging evolves to meet these new challenges. Cognitive biases, such as status quo bias and present bias (described below), can further complicate engagement by leading landowners to favor familiar, immediate solutions like hard armoring while undervaluing long-term risks such as sea level rise and erosion (Gifford, 2011; Weber, 2006). As a result, messaging must be carefully crafted to balance technical accuracy with accessibility, ensure cultural relevance, and help stakeholders meaningfully consider future conditions and potential alternatives (Moser & Ekstrom, 2010).

2.3 Research Questions

The following question I am analyzing came from the Miller et al. (2022) analysis titled *Sea Level Rise and Management Options for Washington's shorelines* and was ranked as a high-priority research need by participants of an October 2024 forum on sea level rise:

1. "How can local governments, advocacy organizations, and others effectively communicate the trade-offs associated with each response option to shoreline property owners and other constituents?" This analysis focuses on Shore Friendly programs with broader implications discussed briefly at the end.

Other questions that supported the analysis of the primary question are:

1. What are the trade-offs associated with shoreline armoring as sea level rises?
2. How do different stakeholder groups respond to varying communication methods?
3. What barriers exist in delivering transparent and engaging messages about place-based shoreline management?

2.4 Data Collection and Analysis

The focus is on three foundational documents that offer insight into both technical and social dimensions of localized shoreline management, and three foundational documents for psycho- and sociological barriers to effective communication around climate issues. While the literature provides foundational insights, informal interviews with Shore Friendly staff helped contextualize these trade-offs through lived experience and practitioner insight.

For technical and social dimensions of shoreline management, the first piece of literature is *Sea Level Rise and Management Options for Washington's Shorelines* by Miller et al. (2022), which provides a comprehensive overview of SLR projections and evaluates various management responses along Washington's coast. Developed through a collaboration between Washington Sea Grant and the Washington Department of Ecology for the Washington Coastal Resilience Project, this report frames the urgency of adaptation planning in the face of rising seas and increasing flood risk. Miller et al. (2022) provide the foundational framework for this paper's analysis of shoreline management trade-offs, which are discussed in depth in Section 4, and examine the projected intensification of sea level rise and its implications for shoreline property owners. Using qualitative assessment, the researchers evaluated various coastal management strategies based on cost, effectiveness, and their social and ecological impacts.

Second, the *Shoreline Armor Focus Group Findings* (Colehour + Cohen et al., 2014b), led by Applied Research Northwest, offers qualitative insight into public attitudes and behavioral drivers related to shoreline armoring. This report emphasizes how property owners perceive armoring decisions,

highlighting the importance of trust, messaging, and technical assistance in motivating voluntary change. This study examined communication strategies, stakeholder responses, and barriers to effective shoreline management communication. It aimed to understand landowner's perceptions and motivations regarding place-based shoreline management, particularly the use of hard armor such as bulkheads and seawalls. Through focus groups, researchers explored concerns about erosion, preferences for informational and financial resources, and reactions to various messaging strategies. Key findings underscored the importance of providing reassurance, trustworthy information, and localized solutions while also addressing distrust in local government. The study informed a social marketing strategy designed to encourage landowners to consider alternatives to hard armoring, promoting more sustainable shoreline practices, and the overall health of the Puget Sound ecosystem.

Lastly, the Shore Friendly *Final Report* (Colehour + Cohen et al., 2014a) serves as a guide for developing a local Shore Friendly program to provide a suite of incentives that encourage landowners to voluntarily adopt natural shoreline protection practices. The report synthesizes outreach strategies, pilot project evaluations, and social marketing research to identify effective ways to engage property owners in behavior change. It also details implementation of lessons, incentive structures, and motivators that shaped the program's evolution and success across Puget Sound. While I reference this report, it is important to note that the Shore Friendly program has continued to evolve since its publication.

For barriers to effective communication, the first piece of literature I analyzed is *The Dragons of Inaction* by Robert Gifford 2011), which explores the psychological barriers hindering individuals from adopting climate change mitigation and adaptation behaviors, despite widespread concern. The article categorizes these obstacles into seven main "dragons," two of which we will use in this analysis: mistrust and perceived risks associated with behavioral change, with a small exploration of values. Perceived risks represent a significant psychological barrier to climate change mitigation, encompassing six distinct categories: functional, physical, financial, social, psychological, and temporal risks that individuals anticipate when considering pro-environmental actions. Alongside this, mistrust is a crucial component of the "discredence" barrier, as its absence from citizens, scientists, or government officials directly impedes the adoption of climate-friendly behaviors.

Second, *Experience-Based and Description-Based Perceptions of Long-Term Risk: Why Global Warming does not Scare us (Yet)* | *Climatic Change* by Elke U. Weber (2006) discusses why individuals and governments often underestimate the risks of climate change. Weber (2006) asserts that personal, immediate experiences strongly influence risk perception, and since direct, severe consequences of global warming are still infrequent for many, visceral alarm is not widely triggered. The article suggests that abstract, statistical descriptions of climate change fail to evoke strong emotional responses necessary for motivating protective action.

Lastly, *A framework to diagnose barriers to climate change adaptation* by Susanne C. Moser and Julia A. Ekstrom (2010) presents a systematic framework for identifying and understanding barriers to climate change adaptation. The authors distinguish between malleable barriers and absolute limits to adaptation, emphasizing that many perceived limits can be overcome through concerted effort. The framework aims to provide a tool for systematically analyzing barriers throughout the adaptation process, acknowledging the complexity and iterative nature of real-world decision-making.

3. Key results

3.1 Current Communication Practices for Property Owners

Effective shoreline management requires clear, accessible, and inclusive communication strategies to ensure that property owners, policymakers, and the public understand the trade-offs associated with

different coastal protection methods. By accessible, I mean in the sense used by the Cambridge Dictionary: something that is easy to understand, as well as easy for everyone to access and use. Currently, local governments, environmental organizations, and state agencies use a combination of in-person engagement, digital tools, and incentive programs to communicate localized shoreline management strategies. Public meetings, workshops, brochures, and informational campaigns are widely used to discuss the impacts of shoreline armoring and alternative approaches, such as nature-based solutions. Shore Friendly has demonstrated strong progress in implementing these strategies. Strategy effectiveness can differ across contexts depending on levels of audience engagement, accessibility, and trust in the information provided, factors that also present opportunities for continued refinement and strengthening.

As described in Section 2.1, Shore Friendly programs provide property-specific site visits, financial incentives, and public education to support voluntary adoption of soft shore alternatives to hard armor. Accommodation to rising water levels is also becoming a larger topic in the Shore Friendly program as well. As the Northwest Straits Foundation states in their 2019 Final Report on the *Shoreline Armoring Reduction Project,* the Puget Sound region needs to start thinking and looking for financial help and relocation options for homes that cannot be protected by soft or hard armor. Communication efforts within Shore Friendly programs vary across counties due to differing local contexts. In Pierce County, frequent outreach is necessary due to the high turnover of property owners. In contrast, Island County presents a different challenge, as long-term residents and multi-generational family estates require tailored approaches to effectively convey the trade-offs of localized shoreline management options.

To address these challenges, local Shore Friendly programs are increasingly utilizing digital tools and interactive engagement strategies to build strategies provided by the original social marketing research. Workshops, Shore Friendly Living series on YouTube, and social media campaigns are becoming more common, providing accessible and engaging platforms for conveying complex information. Additionally, some local programs employ storytelling techniques, incorporating testimonials from property owners who have successfully implemented nature-based shoreline solutions. Local Shore Friendly programs have been actively doing this work and tailoring communication to the owner's specific needs.

However, more work is likely needed to test messaging around how the effects of sea level rise will manifest in the Puget Sound region and trade-offs associated with response options. Several barriers to communication may complicate the development of effective messages and delivery strategies. The following section aims to outline some barriers to communication in hopes that outlining these barriers will help to develop additional tools for communicating for behavior change, whether at a parcel or community level. Strengthening trust, improving accessibility, and fostering more interactive dialogue will be essential for enhancing place-based shoreline management communication practices.

3.2 Barriers to Effective Communication

In general, barriers to effective communication often arise not only from linguistic or disciplinary divides, such as the use of technical and scientific jargon, but also from deeper, more human dynamics like emotional investment in property, mistrust in institutions, or competing visions for the future. When community members feel unheard or perceive the process as performative rather than participatory, trust erodes, and dialogue breaks down. As Siders (2022) prompts us to consider in their article titled *The Administrator's Dilemma: Closing the Gap between Climate Adaptation Justice in Theory and Practice,* making sure that individuals feel as though they have a safe space and the power to express their needs for the intended outcomes. Addressing this directly requires moving beyond transactional engagement and creating inclusive processes that recognize local expertise, respect

divergent priorities, and support shared ownership of decisions, work that Shore Friendly has already been advancing.

Before engaging in outreach or decision-making, experts should reflect on their communication intentions and decide if the intention is to inform, persuade, or co-create solutions. These goals inherently shape message framing. Assumptions about the audience's knowledge and values can strongly influence tone and content, sometimes unintentionally reinforce hierarchies or create distance through technical jargon or oversimplified language. Recognizing these biases is essential for authentic and reciprocal engagement. Priest et al. (2018) emphasize that people are most likely to engage with messages when they perceive a compelling reason to do so. Building trust, therefore, requires communicators to be transparent, thoughtful, and deliberate, ensuring that messaging reflects accuracy, clarity, and integrity. Shore Friendly programs are already working to put these intentions into practice.

Psychological Barriers

Psychological barriers play a significant role in how shoreline property owners interpret and respond to information about coastal risks and management options. The psychological barriers we will be addressing are risk perception or aversion, social values, and distance or construal theory. In considering these dynamics, it is important to recognize that fear-based climate appeals often fall short: they tend to lose effectiveness over time as individuals perceive dangerous climate change as distant or unlikely to affect them personally (Lowe et al., 2006; O'Neill, 2008), and they can even produce weaker effects or unintended reactions when applied in real-world settings (Hastings et al., 2004).

Risk aversion often causes individuals to prefer the perceived safety of familiar strategies, such as maintaining hard armoring, even when nature-based alternatives may offer better long-term resilience (Gifford, 2011). These decisions are further complicated by perceived risk, which is shaped more by personal experience than statistical likelihood, meaning that if a homeowner has not previously experienced flooding or erosion, they may underestimate their vulnerability (Weber, 2006). Risk perception involves not only facts but emotions as well as personal characteristics, including, but not limited to, fear, anxiety, race, gender, political preferences, affiliations, trust, and culture (Covi & Cain, 2015). In these situations, multiple types of risk are at play, making decisions particularly overwhelming for risk-averse homeowners. These include functional, physical, financial, social, psychological, and temporal risks (Gifford 2011). Functional risk refers to the possibility that a product or solution may not perform as expected. Temporal risk relates to the potential loss of time—whether from learning how to use something, completing installation, or handling repairs. In the context of sea level rise, risk communication often falls short of its intended impact because the information presented is frequently too general to evoke an emotional response (Covi & Cain, 2015). As Weber (2006) notes, research across cognitive, social, and clinical psychology has increasingly recognized that people perceive risk through emotional and associative processes, often as much as, or even more than, through analytical reasoning. To reinforce that these decisions and perceptions are driven more by an emotional response than by scientific facts.

Environmental outcomes are a core motivation for Shore Friendly, but behavior change is more effectively encouraged by aligning with homeowners' existing values than by simply appealing to concerns about ecological impacts. As Newell et al. (2014) explains in *The Psychology of Environmental Decisions*, environmental issues are often emotionally and politically charged and deeply influenced by personal and collective values. For many individuals and groups, social values are central to how decisions are prioritized (Schwartz 2006, as cited in Manfredo et al.2017). In *Why Social Values Cannot Be Changed for the Sake of Conservation*, Manfredo et al. (2017) emphasize that values shape not only

decision-making, but also how people perceive and interpret information. Values are embedded in our language, communication styles, social institutions, routines, and relationships with both natural and social environments. These values are formed early in life and remain stable throughout adulthood. However, when values do shift, behavioral change tends to follow (Inglehart, 1997, as cited in Manfredo et al., 2017). Because values have practical, psychological, and social significance (Schwartz, 2012), they can pose a barrier to effective communication, especially when the behavior being promoted conflicts with a person's deeply held beliefs.

In *Adapting to and Coping with the Threat and Impacts of Climate Change,* Reser and Swim (2011) state that social construction, representation, and amplification processes are the three frameworks that describe and influence a person's perception of risks, environmental threats, and global climate change. Social construction is how people, as a collective, impose meaning and order in their reality. These constructs are shaped and molded through social interactions, conversation, and transactions with one another (Reser & Swim, 2011). Social representations provide a framework for interpretation and communication on shared assumptions and understandings. For example, images, texts, cultural expressions, and other communication languages (Reser & Swim, 2011). Social amplification processes are how risk, risk events, and the characterization of both are portrayed. These signals interact with psychological, social, institutional, and/or cultural processes that amplify or weaken perceptions (Kasperson et al., 2003, p. 15 in Reser & Swim, 2011). For a single person, the most consequential effects on their beliefs about climate change are likely to result from their relations with their peers (Kahan et al, 2012). This can create a barrier for behavior change given how much weight social relationships have, materially and emotionally (Kahan et al, 2012). Social marketing attempts to use this construct to its advantage by identifying and intervening through social "influencers".

Additionally, construal level theory (also known as distal theory) suggests that people tend to view distant threats in abstract terms, making it harder to take meaningful action on slow-moving hazards like sea level rise or policy change (Moser & Ekstrom, 2010). Weber (2006) draws on elements of distal theory by suggesting that abstract, future-oriented descriptions of risks or consequences often lack the concrete, emotionally resonant associations needed to prompt behavior change. Distancing is a primary factor when looking at climate change, more specifically at sea level rise, as people view this as spatially and temporally distant, which makes it especially hard to relate to one's lived experiences (Retchless 2017; Newell et al 2014). To reduce this distance, Retchless (2017) suggests creating messaging that is "local but also tangible and personally meaningful."

Shore Friendly has already been advancing this approach, though psychological factors can still limit engagement with program options, underscoring the ongoing need for communication that is place-based, emotionally resonant, and grounded in lived experience.

The Role of Trust and Credibility in Communication

Trust and credibility are foundational to effective place-based shoreline management communication, especially when psychological and structural barriers, outlined in Section 3.2, diminish willingness to engage with long-term risks. Without trust in the source of information or belief in the relevance of the message, even well-designed outreach strategies may fail to inspire engagement or action (Moser & Ekstrom, 2010). Several factors can undermine trust in experts, including doubts about their competence, perceived lack of care or concern, inconsistent messaging, or failure to meet expectations and uphold responsibilities (Cologna & Siegrist, 2020).

For shoreline property owners, trust is often built through relationships with local entities, such as conservation districts, neighborhood associations, or Shore Friendly program coordinators, who are perceived as familiar, knowledgeable, and responsive to local needs (Colehour + Cohen et al., 2014b).

This trust is reinforced when outreach is personalized, localized, and property specific. One-on-one site visits, a cornerstone of Shore Friendly engagement, exemplify this dynamic: they combine technical guidance with face-to-face interaction, allowing concerns to be addressed directly and building confidence in the feasibility of nature-based alternatives (Colehour + Cohen et al., 2014a; Kinney & Francis, 2019). However, consistency in staffing and outreach is just as vital as the initial engagement itself as projects can take years to get to completion (Kaufman, 2019). Shore Friendly programs play a critical role in building credibility by delivering consistent, personalized support (Colehour + Cohen et al., 2014a).

As discussed in Section 3.2, psychological distance, cognitive biases like status quo bias, and mistrust often affect shoreline decision-making (Gifford, 2011; Weber, 2006). These barriers make trust a critical component of effective communication strategies, particularly when addressing uncertain or long-term risks like sea level rise (Moser & Ekstrom, 2010). Trust is fragile, and the way information is communicated must be approached thoughtfully. Even a single instance of exaggerated claims, such as overstatements about climate change or sea level rise, can lead to widespread skepticism and undermine public trust (Gifford, 2011). Building on this, Weber (2006) and Moser and Ekstrom (2010) emphasize that risk communication is most effective when messengers are perceived as relatable and authoritative, and when messages are framed to align with the audience's immediate context and concerns. When topics like sea level rise or regulatory change are presented as distant, abstract, or hypothetical, people may discount their relevance or delay action. This psychological distancing can reduce trust in the message itself unless it is anchored in localized, tangible experiences that make future risks feel present and personally meaningful.

An important consideration when addressing barriers to effective communication, particularly when it comes to building trust, is the high proportion of "weekend" residents along the shoreline. Many of these individuals live in urban areas and only visit their second or inherited family homes for vacations or weekend retreats. Also, many shoreline properties are used for short-term vacation rentals. These patterns can pose several communication challenges. It may be more difficult to establish strong, trust-based relationships with absentee or part-time residents. These individuals are also more likely to miss outreach opportunities, such as workshops or site visits, simply because they reside elsewhere. Furthermore, it can be harder to elicit a place-based response from property owners who are not regularly present to observe or experience the gradual changes occurring along their shoreline. Also, to note, that just because an entire community may be affected by sea level rise, that does not mean that each person holds the same values or perceptions of risk (Graham et al, 2013; Gifford, 2011).

Funding barriers

One of the most significant initial barriers to implementing any shoreline management strategy is the financial burden. While programs like Shore Friendly offer grants and technical assistance, these supports are not consistently distributed based on financial need, and overall funding capacity is limited. Some local programs prioritize the potential for habitat improvement as a key driver of funding decisions. For many property owners, especially in lower-income or high-risk areas, this creates an accessibility gap.

A key financial dimension is the role of flood insurance premiums in shaping adaptation choices. For example, under the National Flood Insurance Program, property owners who elevate their homes or implement flood-proofing measures may qualify for significant reductions in insurance premiums. These cost savings can accumulate over time and partially offset the upfront investment required for accommodation strategies like elevating structures (Miller et al., 2022). However, many shoreline residents are unaware of how flood risk might evolve with sea level rise or how proactive

mitigation steps could influence their rates (Kelly McCaffrey, WDFW, March 2025). Also, it is not known how insurance costs will evolve.

It is also important to note that flood damage is not covered under standard homeowners' insurance, and not all waterfront homeowners in Washington State have flood insurance. Flood insurance is only required if there is an active loan on the property; so many generational homes do not carry policies. Additionally, National Flood Insurance Program building policies provide limited coverage: up to $250,000 for the structure and $100,000 for contents, with not all contents included (FEMA, 2025b). Integrating insurance education into shoreline outreach, especially through workshops, permitting consultations, and online calculators, could offer a powerful tool for motivating change. Framing shoreline adaptation not only as a resilience measure but also as a potential cost-saving strategy may resonate more strongly with financially constrained homeowners.

4. Trade-offs in Shoreline Armoring

A simple definition of trade-offs is that an increase in one factor often results in a decrease in another during the decision-making process. Miller et al. (2022) categorized the trade-offs associated with shoreline armoring options in Puget Sound into three primary categories: financial, ecological, and social/cultural.

Building on this framework, I have introduced an additional category—regulatory trade-offs. Regulations and permitting processes play a significant role in shaping property owners' localized shoreline management decisions, influencing which stabilization options they pursue. Understanding regulatory trade-offs is essential not only for decision-making but also for determining the most effective communication strategies. By recognizing how regulations impact available options, outreach efforts can be better tailored to ensure property owners have the necessary information to navigate permitting requirements and make informed, localized shoreline management choices.

Table 1 below summarizes the key trade-offs associated with each management strategy. Selecting communication techniques that clearly and accessibly convey these trade-offs is essential to support property owners in weighing their options. These categories are examined in further detail in the subsections that follow.

4.1 Financial

Financial considerations often serve as the most immediate and significant barrier to shoreline management decisions. While property owners must weigh a range of factors, the high costs associated with each option—combined with limited availability and inconsistent access to financial incentives—can limit the feasibility of more adaptive or sustainable approaches. This section outlines the financial implications of each shoreline management strategy.

Hard Armor

Hard armoring solutions such as seawalls and bulkheads carry some of the highest upfront and long-term maintenance costs, averaging from $23,700-66,000 (2023 dollars) depending on the material used at installation (Industrial Economics, Inc., 2023). To note, this estimate is not inclusive of equipment and labor, which can be calculated at cost per square foot. These numbers are based on repair and replacement projects, as there were no active installations of new bulkheads at the time of this research (Industrial Economics, Inc., 2023). Though they offer immediate structural protection, their effectiveness declines over time as sea levels rise. Adaptive or modular designs are available but typically come at a premium, further limiting accessibility (Miller et al., 2022).

Soft Shore Armor

Soft shore stabilization techniques, including slope regrades, native vegetation, beach nourishment,

and large wood placements, generally cost less per linear foot than hard armor and provide additional ecological benefits, but have a larger cost variability than hard armor replacements or repairs (Industrial Economics, Inc., 2023). While ongoing maintenance may be required, these strategies are often supported by financial incentives such as grants or technical assistance through programs like Shore Friendly, making them more accessible to some property owners (Miller et al., 2022).

Table 1. Trade-offs associated with Management Approaches

Management Approach	Financial Considerations	Ecological Considerations	Social/Community Considerations	Regulatory Considerations
Hard Armor (e.g., shoreline armor, seawalls, bulkheads)	High upfront and maintenance costs. May become more expensive to maintain with rising sea levels	Causes habitat loss, alters sediment transport, and increases shoreline erosion	May reduce beach access, alters aesthetics, and may create community conflicts over cost-sharing	Often requires complex permitting; may face additional future regulatory restrictions due to environmental concerns
Soft Shore Armor (e.g. native vegetation, beach nourishment)	Lower costs than hard structures but requires long-term & more frequent maintenance (e.g. like a garden that requires regular upkeep)	Less disruptive than hard structures, supports natural shoreline processes	Preserves aesthetics and access but may require education to change social norms around the need for hard armor	Regulations may favor these approaches, but permitting can still be complex
Accommodation (e.g., raising or wet floodproofing)	Variable costs depending on approach; insurance savings and avoided damages may offset costs	Minimal direct impact but may prolong risky land use. Septic systems are still an issue. Could make removal of existing armor easier.	Allows communities to remain in place, reducing displacement stress elsewhere	Regulations may favor these approaches, but permitting, lot setbacks and height restrictions can still be complex depending on location
Retreat and Avoidance (e.g. moving housing farther back or to another location)	High initial costs, but cost-effective long term	Maximizes shoreline resilience and habitat preservation	Causes community displacement but ensures long-term safety, public access, and sustainability	May face legal and political challenges, including property rights disputes and zoning challenges

Accommodation

The cost of accommodation strategies varies widely. Less intensive modifications, such as wet floodproofing, are relatively affordable and may qualify property owners for lower flood insurance premiums, offsetting some initial investment. Examples of wet floodproofing include properly anchoring the structure, using flood-resistant materials below the Base Flood Elevation, protecting mechanical and utility equipment, and using openings or breakaway walls (FEMA 2025). More substantial changes, like elevating structures, can cost on average $30-40,000 (2019 dollars) for a 1500 sq ft (about half the area of a tennis court) home to elevate a house (Coastal Geologic Services, 2020). These numbers are solely for elevating the home, which is estimated to be a third of the total cost associated with accommodation (Coastal Geologic Services, 2020). This may still leave properties vulnerable to future sea level rise (Miller et al., 2022).

Retreat and Avoidance

Retreat involves high upfront costs, including removing/relocating structures, modifying infrastructure, and potentially acquiring new property. Moving a 1500 sq ft house could cost an average of $40-60,000 (2019 dollars) (Coastal Geologic Services 2020). There would be additional costs associated with retreat (foundation, utilities, permitting, construction, etc.), with one contractor estimating the total cost to be upwards of $125,000 (2019 dollars) (Coastal Geologic Services 2020). There would be additional costs associated if you must move a home to another plot of land or parcel of land. Despite these expenses, retreat may offer long-term savings by removing properties from high-risk areas and avoiding future damage. In markets that value resilience, retreat may also protect or enhance property values over time (Miller et al., 2022). One study looked at 4 properties being moved back 50ft or less on Island County, one property showed an increase of value by $50,000, one showed no increase, and two properties showed a decrease in value by $50,000 (Cote & Domanski 2019).

4.2 Ecological

Shoreline management decisions can impact the health of nearshore ecosystems. Hard armoring may protect property but often disrupt natural processes like sediment transport and can degrade habitats for species such as salmon and forage fish. In contrast, softer approaches tend to have less impact on ecological functions but may involve other spatial or planning challenges.

Hard Armor

Hard armor structures have significant ecological consequences. These structures affect sediment delivery, transport processes, and result in the loss of large wood and wrack, which are essential for maintaining shoreline ecosystems. Additionally, hard armor reduces the abundance of intertidal invertebrates and disrupts natural wave dynamics, leading to increased scouring and erosion. As a result, intertidal habitats are diminished, negatively impacting coastal biodiversity and ecosystem resilience (Miller et al., 2022).

Soft Shore Armor

Soft shore armoring presents a less ecologically disruptive alternative to hard armor, as it is designed to work more harmoniously with natural coastal processes. Although stabilizing an unmodified shoreline still has a net negative effect, soft shore strategies are considered to have lower negative effects on shoreline habitats. By maintaining more natural sediment movement and ecosystem function, these approaches may help sustain biodiversity and coastal resilience over time (Miller et al., 2022).

Accommodation

Accommodation strategies typically have fewer direct ecological impacts compared to hard armoring approaches. When combined with the removal of existing hard armor, these strategies can provide net ecological benefits by restoring natural shoreline functions. However, accommodation measures must account for long-term exposure to rising sea levels and increased flood events, which could pose

challenges such as septic system failures and groundwater contamination in coastal communities (Miller et al., 2022).

Retreat and Avoidance

Retreat and avoidance strategies offer the most ecologically beneficial approach, as they allow coastal processes to function naturally and create opportunities for habitat restoration. By providing space for shoreline ecosystems to adapt and regenerate, these strategies support long-term ecological resilience. Although the financial and logistical challenges of retreat can be significant, the ecological advantages are also significant for preserving coastal environments in the face of climate change (Miller et al., 2022), assuming that there is no existing hard armor in place, or the current hard armoring would be removed.

4.3 Social and Community

Shoreline decisions can influence public access, aesthetic values, community sense of place, and local government financial outcomes. While hard armoring may provide a sense of immediate security, it can also reduce beach access, impair views, and limit recreational use. Nature-based approaches, by contrast, may strengthen community connections to the shoreline but can raise concerns about long-term protection and ongoing maintenance. These trade-offs are complex. Some individuals prefer the clean appearance of a bulkhead over what they perceive as a messy beach (Strelioff, 2022). In some cases, hard armor can increase outdoor activity and inclusivity, for example, by providing wheelchair access to the shoreline.

Hard Armor

Hard armor structures on private properties can cause unplanned erosion, resulting in the loss of space on public access beaches, reducing recreational and cultural opportunities for communities. Additionally, these structures may impact property values, positively or negatively, particularly in areas where shoreline access and aesthetic appeal contribute to real estate demand. Hard armor can also exacerbate erosion on neighboring properties by altering natural sediment transport, potentially leading to unintended consequences for adjacent landowners. Furthermore, while these structures provide localized protection, they do not eliminate the risk of widespread flooding, which may still affect entire neighborhoods during extreme weather events (Miller et al., 2022).

Soft Shore Armor

Soft shore armoring offers a more balanced approach, helping to maintain or even enhance public accessibility and the natural aesthetics of coastal areas. By preserving the dynamic nature of shorelines, these strategies can support community stewardship of the waterfront while providing protection from erosion and flooding. As a result, soft shore solutions are often favored in areas where maintaining scenic and recreational value is a priority (Miller et al., 2022).

Accommodation

Accommodation strategies can be more feasible for new construction, particularly when supported by updated building codes and redevelopment policies that encourage resilience measures. These approaches allow residents to remain in place, reducing displacement and minimizing disruptions to local economies and social networks. By supporting community vitality and well-being, accommodation strategies can offer a more socially sustainable alternative to more disruptive adaptation measures (Miller et al., 2022).

Retreat and Avoidance

Retreat and avoidance strategies are often perceived as impractical in densely populated urban areas, where limited space and high development pressures pose significant challenges. The feasibility of retreat is inherently political and socio-economic, as it involves substantial financial investments, legal considerations, and long-term planning. Funding mechanisms, property rights, and regulatory

frameworks all play a critical role in determining whether retreat can be a viable option in different communities (Miller et al., 2022).

4.4 Regulatory

Different localized shoreline management options come with varying permitting requirements and compliance challenges. These processes can influence landowner decisions based on perceived time, cost, and feasibility—and in some cases, may lead to hard armor structures being installed without the required permits. For example, a study has shown that in Island County non-compliance rates are as high as 96% (Herrera Environmental Consultants, Inc., 2024).

Hard Armor

The implementation of hard armor structures often involves complex permitting processes due to their potential environmental impacts. Regulatory agencies may prohibit or impose strict requirements to mitigate disruptions to coastal ecosystems, and these restrictions may become even more stringent in the future as concerns over shoreline erosion, habitat loss, and climate resilience grow. As a result, property owners investing in hard armor solutions must navigate evolving regulations that could impact long-term feasibility and maintenance costs (Miller et al., 2022).

Soft Shore Armor

Despite being a more environmentally sustainable option, soft shore armoring techniques are not without regulatory challenges. Many property owners experience frustration with the extensive permitting requirements associated with these approaches. Programs such as Shore Friendly aim to streamline the process and provide guidance, but bureaucratic hurdles can still deter some from pursuing soft shore solutions. Addressing these permitting inefficiencies could improve accessibility and encourage broader adoption of nature- and place-based shoreline management strategies (Miller et al., 2022).

Accommodation

Accommodation strategies, particularly those involving new construction or redevelopment, are subject to complex building codes and regulations, with properties located in Federal Emergency Management Agency-designated flood zones subject to development requirements. However, owners who implement floodproofing measures such as elevating structures or using flood barriers may be eligible for reduced NFIP premiums, incentivizing risk-reducing accommodation strategies (Kousky, 2018). Properties that are non-compliant with current floodplain regulations may see reduced market value due to the added cost of mitigation or insurance (FEMA, 2025a). Ensuring that redevelopment regulations, for after a flood event or substantial remodeling, are both effective and practical, is essential for making accommodation a viable adaptation strategy while minimizing regulatory burdens (Miller et al., 2022).

Retreat and Avoidance

Retreat and avoidance strategies face significant regulatory and financial barriers, including zoning restrictions, property rights issues, regulatory takings, and the need for substantial funding. However, property rights issues and regulatory takings apply primarily in cases of mandated retreat, whereas Shore Friendly programs emphasize voluntary approaches. Relocating communities or restricting development in high-risk areas often requires coordinated policy efforts and financial incentives, which can be difficult to secure. The legal complexities of land use planning, coupled with potential resistance from property owners, make retreat a politically and economically challenging strategy despite its long-term ecological benefits (Miller et al., 2022).

4.5 Techniques to Communicate Trade-offs

The Shore Friendly program and its partners have developed a suite of communication techniques that can be strategically applied to address these varied dimensions and strengthen local programs for informed shoreline stewardship (Colehour + Cohen et al., 2014a; Kinney & Francis, 2019). To overcome trust barriers and cognitive biases such as risk aversion and social values, communication must integrate local examples of projects and interactive practices that show proven results, approaches that Shore Friendly is already advancing. These techniques help normalize soft shore strategies and reinforce confidence in alternatives to armor, particularly when supported by emotionally engaging and attention-grabbing data, visuals, and neighbor testimonials (Gifford, 2011; Weber, 2006).

Workshops and online information hubs like Shore Friendly's "Your Options" page could be especially valuable for addressing *financial trade-offs*. These methods allow property owners to access clear, detailed information about the potential long-term cost savings and project maintenance costs associated with soft shore stabilization, as well as available financial incentives and permitting costs. Workshops provide interactive environments for discussing concerns and questions, while online hubs can offer 24/7 access to cost calculators, permitting guides, and FAQs that reduce entry barriers for action (Kuehne et al., 2014). One-on-one site visits and technical assistance incentives that could support design development are also beneficial at addressing the financial trade-offs (Colehour + Cohen et al., 2014a). This technique is the cornerstone of Shore Friendly programs in Puget Sound.

To address *ecological trade-offs*, tours and testimonial videos from participants of restored shorelines and Shore Friendly site visits offer compelling, place-based learning opportunities. These tools help landowners visualize the environmental benefits of alternatives to hard armoring, such as improved fish habitat and natural sediment transport. One-on-one site visits also serve as a key communication tool, delivering tailored advice that helps overcome uncertainty and reinforces trust through personalized guidance (Colehour + Cohen et al., 2014a).

In the realm of *social and cultural trade-offs*, certified professional training, neighborhood beach walks, and testimonials demonstrate how natural shoreline approaches maintain aesthetic quality and enhance a sense of place. These methods allow practitioners and property owners to share relatable stories and technical knowledge in a credible and accessible format, fostering peer-to-peer learning and community norms that support soft shoreline solutions. Certified professional training methods drive social change by engaging trusted influencers who are active within local communities. Tours of restored shorelines and Shore Friendly site visits can also offer compelling, place-based learning opportunities.

Regulatory trade-offs, often perceived as the most daunting, can be mitigated through streamlined permitting options and one-on-one permitting assistance. Workshops and educational materials can also provide the help needed to advance the permitting process for residents. These approaches demystify regulatory steps and provide property-specific navigation assistance through local, state, and federal requirements. Providing step-by-step guidance helps build confidence and reduce delays that might otherwise deter landowners from exploring non-traditional options (Kinney & Francis, 2019). Shore Friendly programs currently provide regulatory help to landowners.

5. Evaluation of Communication Strategies

One of the key insights for strengthening communication techniques for programs is recognizing that communication must be tailored not only by topic but also by audience perceptions. Property owners approach shoreline decisions with differing values, risk tolerances, and understandings of ecological function and regulatory processes, which shape how they engage with specific trade-offs. Shore Friendly programs are already implementing this approach by adapting messaging strategies to

these varying perceptions, helping ensure that property owners are effectively supported in making informed decisions.

This requires training outreach teams to diagnose which trade-offs matter most to each property owner and how best to communicate with them. For example, some owners may prioritize safety and protection over cost, while others may be more responsive to financial incentives or habitat benefits.

Psychological dimensions further complicate this landscape. Risk aversion may lead property owners to default to familiar strategies like hard armor. Perceived risk, especially in the absence of direct personal experience, can cause individuals to discount erosion or sea level rise as unlikely or irrelevant. Moreover, construal level theory suggests that the more abstract or distant a risk feels (in time, geography, or identity), the less urgent or trustworthy it becomes (Weber, 2006; Gifford, 2011). For programs to succeed, training and resources must help practitioners recognize these barriers and utilize this knowledge to form communication techniques that ground future risks in present-day, place-based relevance. Examples include working alongside social scientists, using storytelling, visuals, and localized examples. Outreach is only one part of achieving lasting behavior change; success also requires a complementary package of incentive-based tools. Collaborating with a social scientist can help ensure that the psychological and social barriers practitioners encounter is appropriately addressed when designing incentive packages or assessing site-specific needs. Table 2 summarizes available tools for communication, their strengths, and challenges.

5.1 Tailoring Communication to Trade-offs

Tailoring communication to trade-offs requires acknowledging the psychological dynamics that shape decision-making. Fear appeals, for example, often make climate change feel important but simultaneously leave people feeling powerless and overwhelmed, discouraging personal action (O'Neill & Nicholson-Cole, 2009). They can also reinforce perceptions that climate change is distant or uncontrollable, leading to fatalism, denial, or apathy rather than engagement (O'Neill & Nicholson-Cole, 2009). By framing trade-offs in ways that resonate with social values and place-based needs, emphasizing tangible benefits, and building lasting trust, communicators can foster more constructive and empowering engagement. Table 3 outlines communication strategies for addressing common psychological barriers. Although the barriers are listed in separate sections, they often overlap in practice and may require coordinated, tailored approaches.

Table 3 references a December 2022 extreme water level event where king tides combined with a strong winter storm, heavy rainfall, low barometric pressure, and onshore winds to produce significant coastal flooding (Hart, 2023). The term "king tide" is commonly used to describe exceptionally high tides, which are essential to track because they provide a preview of future sea level rise impacts (Hart, 2023). As sea levels continue to rise, existing coastal hazards—including shoreline and bluff erosion, storm surge, flooding, and saltwater intrusion—are expected to intensify. These changes carry wide-ranging consequences, from loss of habitat and damage to homes and infrastructure, to reduced shoreline access, shifts in salinity in streams and groundwater, and broader social, cultural, and economic impacts (Hart, 2023).

Table 2. Outreach, Communication, and Incentive Tools

Strategy	Description	Target Audience	Strength	Challenges
Workshops	Interactive sessions educating property owners on erosion, place-based shoreline management, and soft shore alternatives	Property owners (both armored and unarmored)	High engagement, direct knowledge transfer, fosters community discussion	Requires scheduling; attendance may be low for weekend residents
Individual Site Visits	Dedicated experts providing localized, on-demand advice about shoreline management	Property owners seeking information on alternatives to hard armor	Personalized guidance addresses site-specific concerns	Resource-intensive, may require third-party involvement to maintain trust. Staffing capacity and turnover
Certified Professional or Influencer Training	Training for professionals that provide advice and services to waterfront property owners to ensure best practices in localized shoreline management	Contractors, engineers, landscaping professionals, and real estate agents	Improves professional knowledge and increases the adoption of best practices	Requires incentivization for professionals to participate
Online Information Hub	A centralized website containing case studies, resources, and contacts for localized shoreline management	All shoreline stakeholders	Easy access to comprehensive resources, available at any time	Need ongoing updates and user-friendly design. Potentially requires user-friendly information
Financial Incentives	Development of additional financial incentives. Including grants and a potential future loan program for property owners considering armor removal and sea level rise adaptation measures	Property owners who are hesitant due to cost concerns	Reduces financial barriers and increases willingness to explore alternatives	Requires clear communication of benefits (e.g., favorable loan terms, easy application process) and funding availability
Technical Assistance	Guidance and support are provided to property owners to help them understand options and implement effective, sustainable solutions. Ie. Guided permitting help, support procuring other grants	Property owners (both armored and unarmored)	Personalized guidance to address site specific concerns and reduce financial barriers.	Requires scheduling, needs user-friendly information, and resource intensive

Table 3. Examples of how to tailor communication for potential barriers

Potential Communication Barrier	Distal theory (psychological distance)	Risk perception	Mistrust of government agencies or external authorities	Values
Definition	Suggests that people tend to view distant threats in abstract terms	How individuals interpret and respond to risks is shaped as much by emotions and personal experience as by factual analysis. This is influenced by a tendency to perceive potential losses as greater than equivalent future gains	Trust refers to the confidence that information sources are credible and relevant, whereas mistrust reflects doubt or skepticism that can hinder engagement	Guiding principles that shape how people prioritize decisions and interpret environmental and social issues. They are emotionally and politically charged orientations that, when activated, influence judgments and behaviors across different contexts
Tailoring Strategies	Frame messages around current family well-being or legacy. Emphasizing existing and impending threats, as well as past, present, and future impacts, increases salience and personal relevance	Use property-specific examples to show benefits without compromising safety. Personalized examples reduce psychological distance and address perceived risk	Partner with trusted community intermediaries & local entities for outreach Trust-building through familiar messengers increases openness to new ideas	Partner with trusted community organizations, neighbors, and local entities for outreach Social or community groups are a more viable option to elicit behavior change based on values
Effective Communication Tool(s)	Storytelling, timelines, and interactive scenarios	One-on-one site visits, 3-D visualizations of shoreline change or flood conditions	Co-hosted events with neighborhood associations, conservation districts or local nonprofits and provide consistent support, community centered workshops, testimonials from Shore Friendly participants, neighborhood associations	Co-hosted events with local and trusted organizations and/or neighborhood associations. Personalized examples of local efforts, preferably by neighbors
Examples	Use storytelling to relate the December 2022* high-water event to active and impending threats e.g., emphasizing that coastal flooding is a current threat, describing how acting now could mean your children or grandchildren inherit a shoreline property that weathers storms and preserves the beach they played on as children	Use visuals and narratives of the December 2022* high-water event to show local flooding, highlight how nature-based solutions could reduce current and future risks, and frame costs in terms of avoided future damages on their parcel, in Puget Sound, or in that specific community	Have local conservation districts and neighborhood associations co-host informal workshops or coffee gatherings where residents receive consistent, easy-to-understand information about shoreline adaptation options, including information from residents about their lived experiences of armor removal projects, flooding during the December 2022* high water event, or home elevation/relocation projects	Highlight examples of neighbors working together after a high-water event, like the Puget Sound December 2022* flooding or any king tide event, to protect beaches, community spaces and marine habitats. Emphasizing these collective actions can motivate broader participation by showing how protecting shared community values also supports individual priorities, such as safeguarding private property and maintaining its value in the face of risk

*NOAA houses a hub for tide gauges with various stations nationwide, which is handy for checking today's highs/lows, pulling datasets, and examining long-term water level changes. The Seattle station was established in January 1899. To date, the highest recorded water level was on December 27, 2022

6. Discussion

This analysis highlights the multifaceted trade-offs shoreline property owners face when evaluating place-based shoreline management options in Puget Sound. These trade-offs span financial, ecological, social, and regulatory dimensions, with each management approach presenting unique costs, risks, and benefits. While hard armor remains a default strategy for many, it often imposes long-term ecological and financial burdens. The synthesized framework above highlights common communication challenges in place-based shoreline management and pairs them with tailored strategies shown to be effective in Puget Sound communities.

Enhancing the capacity of local programs requires communication strategies that are not only technically sound but also accessible, trusted, and responsive to community-specific needs and vulnerabilities. Programs that build credibility through transparency, consistency, and community collaboration are more likely to foster engagement. Shore Friendly has already been advancing this approach by tailoring outreach, building trust, and equipping property owners with clear, locally relevant information. Without effective messaging about and new incentives for changing conditions, many property owners may default to traditional hard armoring solutions to protect their property from rising waters, unaware of the long-term ecological and financial trade-offs. Addressing these communication gaps is essential for strengthening local capacity and fostering widespread adoption of more sustainable and localized shoreline management practices or managed retreat options.

At the individual property level, programs like Shore Friendly focus on voluntary, landowner-driven decisions where trust and technical support are more important than broad consensus (Colehour + Cohen et al., 2014a). For example, to address regulatory complexity, Shore Friendly coordinators provide step-by-step permitting support and personalized guidance that clarifies the process (Colehour + Cohen et al., 2014a). In contrast, community-scale adaptation efforts, such as those in South Park and emerging initiatives in Whatcom County, require multi-stakeholder collaboration to ensure that resilience strategies reflect shared values, vulnerabilities, and long-term priorities (Duwamish River Community Coalition 2023; City of Seattle 2025). In these contexts, co-produced communication strategies involving neighborhood associations, conservation groups, and local governments can help surface diverse needs, build legitimacy, and support equitable decision-making.

- One of the primary implications for shoreline management programs broadly is the need to enhance stakeholder engagement through diverse and inclusive communication methods. While public meetings and policy documents serve an important role in a broader shoreline management role, they often fail to reach more specific audiences, including historically underserved communities, shoreline property owners, and those with limited access to technical resources. Expanding outreach through multilingual materials, targeted social media campaigns, and community-led workshops can improve the accessibility and cultural relevance of shoreline stabilization information for diverse property owners (Colehour + Cohen et al., 2014a; Duwamish River Community Coalition, 2023).

Several community-based efforts in the Duwamish River Valley offer promising examples of how local capacity can be enhanced through tailored outreach and trusted messengers:

- **Duwamish River Community Coalition**: Offers culturally responsive outreach and immediate flood response services to frontline residents, helping bridge gaps in trust and accessibility (Duwamish River Community Coalition 2023).
- **Seattle Public Utilities**: Maintains an online coastal flooding database with tide predictions, supporting proactive preparedness and real-time decision-making (Seattle Public Utilities 2025).

- **Duwamish Valley Resilience District**: Provides a comprehensive set of tools and planning resources to address cumulative environmental burdens and climate displacement risks through community-driven adaptation (City of Seattle, 2024).

In response to accessibility and equity gaps, groups like the Duwamish River Community Coalition have deployed multilingual, culturally relevant outreach events to build trust and ensure communities are included in adaptation planning (Duwamish River Community Coalition 2023). To overcome psychological distancing from climate risks, Whatcom County has used localized flood visualization tools and vulnerability assessments to make abstract hazards like sea level rise feel immediate and actionable (Whatcom County, 2024)

This analysis underscores the need for audience-centered, context-specific strategies—particularly those that engage trusted messengers, simplify complex information, and resonate with lived experience, value, and risk perceptions of different shoreline stakeholders. One-size-fits-all messaging fails to reach or resonate with diverse property owners and communities affected by high water events. Shore Friendly programs are already modeling this approach by offering personalized site visits, relevant workshops, and trust-building through local organizations, which have proven effective in advancing sustainable shoreline practices. By structuring communication efforts around these principles, local governments and nonprofits can build more durable and equitable resilience to coastal change (Moser & Ekstrom, 2010; Weber, 2006).

Gifford (2011) recommends collaborating closely with professionals from other disciplines, a recommendation that remains highly relevant in this context. Engaging both technical experts and social scientists can be especially valuable for identifying the psychological barriers homeowners may face, determining how best to address them, and tailoring information to support the desired behavior change. Covi & Cain (2015) recommend communicators pay attention specifically to the way your messages invoke an emotional response, as this will guide your evaluation of how your intended audience perceives risks. Bradley & Reser (2016) recommend that an informed social science understanding of the way people experience, appraise, adapt, and respond to risk is a prerequisite to communication work. Also, to understand that within this work people will be "coming to terms" with the behavior changes needed for these risks, termed psychological adaptation (Bradley & Reser 2016).

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