

Local Leadership, Collective Efficacy, and Adaptive Capacity in a Rural Coastal Community:
The Case of North Cove, Washington

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Abstract

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Rural coastal communities face accelerating erosion and sea level rise, yet their capacity to respond depends on more than material resources or hazard severity. Adaptive capacity frameworks describe the domains through which communities respond to environmental change, but say less about the social processes that shape them, particularly local leadership and collective efficacy in rural U.S. coastal settings. This thesis addresses that gap through a qualitative case study of North Cove, Washington, drawing on 32 interviews to ask what social processes support or limit the community's adaptation to coastal erosion. Findings show that local leaders functioned as boundary spanners, brokering resources and knowledge between community and government, and built residents' collective efficacy through visible results and accessible participation, though efficacy was dynamic, rising with visible success and declining as urgency faded. Informal experimentation and psychological co-benefits further shaped and reinforced this capacity. These findings extend adaptive capacity theory and carry practical implications for rural coastal communities.

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Chapter 1: Introduction

Background

As sea level rise, extreme weather, and erosion continue to threaten societies in the wake of climate change, rural coastal communities are facing heightened vulnerabilities. In the Pacific Northwest, a sea level rise of 1.0m in the next century is predicted to severely erode 90% of current active beaches by length (Peterson et al., 2021). Rural communities that depend on the land for economic stability are especially vulnerable to these changing environmental conditions (Tolulope et al., 2025). In southern Washington state, beaches that rely on riverine sediment deposition have also been drastically impacted by the construction of jetties and the damming and dredging of the Columbia River throughout the 20th century (Gelfenbaum & Kaminsky, 2010). As communities in this region have attempted to protect their lands and ways of life, many have faced challenges securing external support from government and nonprofit institutions (Bayle et al., 2021).

Despite growing interest in how communities adapt to climate-related risks (USGCRP, 2023), significant gaps remain in our understanding of the social processes that drive community adaptation, particularly in rural settings. One framework that provides a useful lens for understanding these processes is the adaptive capacity framework developed by Cinner et al. (2018), which conceptualizes adaptive capacity as the set of capacities that enable individuals and communities to respond to and navigate environmental change. The framework identifies five interconnected domains—assets, flexibility, social organization, learning, and agency—that shape the ways communities are able to respond to changing conditions, but there has been limited evidence to show how these domains are activated and connected in practice, particularly through local leadership, collective efficacy, and community engagement processes through

which rural communities mobilize. Collective efficacy has been shown to influence community adaptation in other contexts (Thaker et al., 2016), and local leadership has been recognized as a critical node in adaptation networks (Moser & Ekstrom, 2010), but neither construct has been well integrated into adaptive capacity frameworks, nor examined together, in a U.S. rural coastal context.

This gap is especially consequential because the communities facing the most severe coastal hazards are often the ones with the least institutional capacity to respond. Yet a growing body of evidence suggests that some low-resource rural communities still sustain meaningful adaptation through the social dimensions that also shape a community's ability to respond. One such example is North Cove, an unincorporated community in southern Washington situated along one of the fastest-eroding shorelines in the western United States, where locally-led efforts have slowed decades of severe erosion largely without formal institutional resources (Bayle et al., 2021). Cases like this suggest that adaptive capacity cannot be reduced to biophysical indicators of risk, and that frameworks emphasizing social processes such as local leadership and collective efficacy are needed to understand how communities adapt from the bottom up.

To address this gap, this research asks: *what are the social processes that support or limit North Cove's adaptation to coastal erosion?* Through a qualitative case study of community members' and practitioners' experiences with erosion and adaptation, this study aims to illuminate the role of local leadership, collective efficacy, and community engagement in a community experiencing rapid environmental change and limited external support. This research offers grounded insight into how adaptation is successfully implemented from the bottom up, and what sustains that adaptation over time.

Aims

This thesis aims to:

- 1) Identify and describe the social processes, including local leadership and collective efficacy, that have supported or limited North Cove's past adaptation to coastal erosion
- 2) Examine how these social processes relate to and affect the community's ongoing adaptive capacity to address ongoing coastal erosion
- 3) Extend existing adaptive capacity frameworks by identifying the mechanisms through which social processes activate and connect the assets, flexibility, social organization, learning, and agency domains of Cinner et al. (2018) in a low-resource, rural coastal setting.

Thesis Structure

This thesis contains two substantive and connected chapters. Chapter 2 develops the conceptual foundation needed to interpret North Cove's experience, synthesizing five bodies of literature that speak to different dimensions of adaptation that have yet to be connected. Chapter 3 answers the study's guiding research question through the North Cove case study. It draws on the constructs and gaps identified in the review, which inform the interview protocol and analytical coding, and returns to the literature in the discussion to show where the findings confirm, extend, or complicate it.

Chapter 2 reviews five interconnected bodies of literature that build the conceptual foundation for the case study. First, it establishes the structural context of rural coastal adaptation, including the governance constraints, demographic pressures, and resource limitations that shape how these communities respond to environmental change. Second, it turns to community-based adaptation, the participatory approach most commonly used to address

those constraints, and to the construct of community engagement that underlies it. Third, adaptive capacity frameworks - particularly Cinner et al.'s (2018) five domains - provide the central dimensions used to evaluate community responses throughout the thesis. Fourth and fifth, the chapter examines efficacy and local leadership as two constructs that cut across and animate the other dimensions of adaptive capacity, closing with a synthesis of how these literatures inform the questions this thesis investigates.

Chapter 3 takes a qualitative case study approach to investigate the research question. North Cove represents an extreme case for studying adaptive capacity. The community faces some of the highest erosion rates on the U.S. western coast (Hart, 2024), with limited institutional resources and no formal municipal government, that has nonetheless sustained a locally-led adaptation effort for nearly a decade. Extreme cases such as this are particularly well suited to theory development, since they surface social processes and mechanisms that may be less visible in more typical or resource-rich settings (Yin, 2018).

The methods section describes the study's qualitative case study design, including the recruitment of 32 participants, comprising local residents and adaptation practitioners with direct experience in North Cove's erosion management, through purposive and snowball sampling. Data for this study were collected through semi-structured interviews with all 32 participants. Additional field observations of community events related to coastal erosion and adaptation planning supplemented this process by providing background context on the community and supporting participant recruitment but were not analyzed as data. Interview transcripts were coded iteratively in ATLAS.ti using an abductive approach that moved between inductive, exploratory coding and deductive coding drawing on the adaptive capacity framework developed by Cinner et al. (2018).

The results section presents six themes addressing the study's research question. The first five themes describe the social processes that have supported or limited North Cove's past adaptation, including the boundary-spanning role of local leaders, the role of informal experimentation in generating proof of concept for novel erosion-mitigation strategies, the values and risk perceptions that shape resident engagement, the mechanisms through which leadership builds collective efficacy, and the distribution of adaptation responsibilities between government and community. The sixth theme examines the co-benefits of community engagement and how they reinforce the community's ongoing adaptive capacity.

The discussion section interprets these findings in relation to the literature reviewed in Chapter 2, with particular attention to the boundary spanning and knowledge brokering literature, the efficacy literature, the locally-led adaptation literature, and the community-based adaptation literature on co-benefits. The chapter closes by identifying the study's limitations, proposing directions for future research, and outlining the study's implications for policymakers, adaptation practitioners, and the North Cove community itself.

Theoretical Contributions and Broader Impacts

This thesis makes several theoretical contributions to the study of adaptive capacity in rural coastal communities. First, it identifies local leadership as a cross-domain enabling mechanism within Cinner et al.'s (2018) adaptive capacity framework. While the framework describes what adaptive capacity consists of, it says little about how the assets, flexibility, social organization, learning, and agency domains are activated in communities with weak formal institutions. This thesis draws on the boundary spanning and knowledge brokering literature

(Tushman, 1977; Bednarek et al., 2018) to argue that in North Cove, local leaders perform this activating function directly, connecting the community to external resources, translating technical knowledge across institutional boundaries, and building social ties through which coordinated adaptive action is possible.

Second, this thesis extends the literature on collective efficacy and adaptive capacity by documenting the specific leadership practices through which collective efficacy is built in a rural coastal community, and by identifying the dynamic, sometimes reversible, character of efficacy as an adaptive resource. Existing collective efficacy research in coastal adaptation contexts remains thin and has focused disproportionately on fisheries communities in the Global South (Mzimela & Moyo, 2023; Vallury et al., 2022). To my knowledge, this thesis offers one of the first examinations of collective efficacy in a rural North American coastal context, revealing a complacency paradox in which visible adaptive success can itself erode the urgency that originally motivated community engagement.

Third, this thesis contributes to the community-based adaptation literature by articulating a feedback relationship between the psychological and social co-benefits of community engagement and a community's adaptive capacity going forward. Where prior research has recognized that community-based adaptation (CBA) projects produce co-benefits alongside their hazard-mitigation goals (Gero et al., 2011; Kirkby et al., 2018), this thesis shows how those co-benefits, including reduced anxiety, renewed hope, and strengthened social bonds, shape the social organization and collective efficacy on which future adaptive action depends.

Beyond these theoretical contributions, this research carries practical implications for policymakers, adaptation practitioners, and the North Cove community itself. For local, state, and federal government agencies working on rural coastal adaptation, the case demonstrates that

regulatory flexibility can create meaningful opportunities for adaptive learning in low-resource communities. The informal, low-cost experiments that generated proof of concept for North Cove's erosion-mitigation strategy would not have been possible under a stricter enforcement environment, and the agencies that eventually became the community's most important partners did so in part because they were willing to treat early grassroots results as evidence. Creating formal pathways for low-stakes experimental trials in rural coastal communities could lead to adaptive learning that current regulatory structures often prevent.

For adaptation practitioners and funders, the findings highlight the risk of investing in community-based projects without investing equally in the boundary-spanning leadership that connects those projects to the community and sustains them over time. North Cove's adaptive capacity was built through relationships, trust, and technical credibility accumulated over years of persistent work by a small number of individuals. Government-led erosion-control projects that neglect the ongoing responsibilities of community leaders outside of the planning phase may struggle to be sustained when those individuals step away.

For the North Cove community, this research affirms that its residents' willingness to experiment, advocate, and organize in the face of an immense threat and significant structural disadvantages has produced results that other communities and agencies are now learning from (Bayle et al., 2021). Findings from this research will be shared back to the community through a brief report and local presentation, offering residents a grounded account of the social processes that have shaped their adaptation to date and the factors that may shape their community's resilience going forward.

Chapter 2: Building Adaptive Capacity in Rural, Coastal Communities: The Roles of Efficacy and Local Leadership

Coastal communities worldwide face accelerating climate threats, yet their capacity to respond varies dramatically, shaped not only by physical exposure and material resources but also by the social processes that enable communities to organize and act. This review develops the theoretical foundation for a case study of North Cove, Washington, a rural coastal community confronting severe shoreline erosion. Existing adaptive capacity frameworks, including the widely used five-dimensional model developed by Cinner et al. (2018), provide a useful way to conceptualize what communities need to respond to environmental change. Cinner et al. identify five interconnected domains—assets, flexibility, social organization, learning, and agency—but the framework provides less detail on how these capacities are activated and linked through social processes in practice. This gap is particularly important in low-resource rural settings, where limited formal institutional capacity may place greater responsibility for adaptation on community members and local organizations. This review therefore asks: *what social processes support or limit rural coastal adaptation?* It argues that local leadership and collective efficacy may function as social mechanisms that activate and connect dimensions of adaptive capacity, shaping whether communities are able to mobilize and sustain responses to environmental change.

To develop this argument, the review draws on five interconnected bodies of literature. It first situates rural coastal communities within the broader adaptation literature, focusing on governance constraints, demographic pressures, resource limitations, and other structural conditions that differentiate rural coastal communities from their urban counterparts (Jurjonas & Seekamp, 2018; Magnan et al., 2023). It then examines community-based adaptation (CBA) as a

participatory approach intended to address these constraints, while considering tensions surrounding power, representation, and long-term sustainability (Yates, 2014; Mills-Novoa, 2023). The review next turns to adaptive capacity, tracing the development of multidimensional frameworks that emphasize assets, flexibility, social organization, learning, and agency (Cinner et al., 2018; Gupta et al., 2010). Finally, it examines efficacy and local leadership, two social processes that may be particularly important for understanding how adaptive capacity is enacted in practice, especially where formal institutional capacity is limited (Bandura, 1997a; Bandura, 1997b; Meijerink et al., 2015; Gisevius et al., 2025).

Together, these literatures reveal several gaps that motivate the North Cove case study. Although adaptive capacity frameworks identify the capacities associated with effective responses to environmental change, less attention has been given to the social linkages through which those capacities are activated and combined. Collective efficacy remains understudied in North American coastal adaptation contexts (Mzimela & Moyo, 2023), and leadership dynamics remain relatively underexamined in U.S. rural adaptation (Gisevius et al., 2025). Examining these processes together provides an opportunity to move beyond identifying the components of adaptive capacity toward understanding how rural communities mobilize those capacities to respond to persistent environmental change.

Table 1: Summary of Bodies of Literature, Relevance to Case Study, and Key Citations

Body of Literature	Relevance to Case Study	Key Citations
Rural Coastal Adaptation	Establishes the structural vulnerabilities of rural coastal communities (limited governance capacity, aging populations, resource-dependent economies) and illustrates the slower pace of adaptation relative to urban	Molnar (2010); Jurjonas & Seekamp (2018); Magnan et al. (2023)

	coasts, motivating a context-specific framework.	
Community-Based Adaptation (CBA)	Introduces CBA as the dominant equitable adaptation approach and its core tensions around power, sustainability, and representation, framing the conditions under which community engagement succeeds or fails.	Ayers & Forsyth (2009); Yates (2014); Kirkby et al. (2018); Mills-Novoa (2023); Selje et al. (2024)
Adaptive Capacity	Provides a synthesis of existing dimensions used to evaluate how residents and adaptation practitioners build or constrain their capacity to respond to erosion.	Gupta et al. (2010); Engle (2011); Cinner et al. (2018); Green et al. (2021); Barnes et al. (2025); Chapagain et al. (2025)
Efficacy (Self and Collective)	Identifies individual and community-level confidence in collective action as understudied socio-cognitive drivers of adaptive behavior, and establishes collective efficacy as a critical but empirically scarce dimension in North American coastal contexts.	Bandura (1997a); Bandura (1997b); Thaker et al. (2016); Hudson et al. (2020); Ayal et al. (2021); Mzimela & Moyo (2023)
Local Leadership	Documents the bridging and mobilizing functions of local leaders in rural adaptation contexts and highlights the gap in understanding leader motivations and strategies within U.S. rural coastal communities.	Moser et al. (2012); Meijerink et al. (2015); Liu & Han (2023); Bezboruah et al. (2024); Gisevius et al. (2025); Barnes et al. (2025)

Rural Coastal Adaptation: An Overview

Coastal Adaptation Overview

Communities in coastal zones are among the most climate-vulnerable groups, facing sea-level rise, intensified storm surges, flooding, and erosion. Griggs & Reguero (2021) emphasize that over 300 million people live in low-lying coastal areas, including 20 of the world's largest cities, making these areas highly exposed to climate impacts. They warn of accelerating sea-level rise that will inundate cities, infrastructure and ecosystems, cause saltwater intrusion, and displace hundreds of millions. Climate change also modifies storm patterns, waves, and coastal processes, compounding flooding and erosion. Severe erosion already affects the western United States and is projected to worsen as seas rise (Griggs & Reguero, 2021; Hart, 2024). Despite the urgency, adaptation progress is slow. Magnan et al. (2023) assessed the global state of coastal adaptation using a structured expert judgement approach applied to 61 local case studies, scoring each across six dimensions, including risk knowledge, planning, concrete action, institutional capacity, evidence of risk reduction, and long-term strategic planning. They found that coastal communities worldwide have achieved only about half of their full adaptation potential across these measures, with many coastal areas still lacking comprehensive action. They also found that urbanized coasts are adapting at a faster rate than rural ones, with rural cases scoring lower across most of the six dimensions assessed.

Rurality and Coastal Vulnerability

Rural coastal communities are generally defined by low population density, geographic remoteness, and economies based on natural resource industries (e.g. fishing, farming, forestry). However, definitions vary by context. Afifi et al. (2022) argue that the dominant view of rural as

simply under-resourced is misleading, because this framing overlooks the social capital, traditional knowledge, and other social assets that many rural communities draw on. They call for a new paradigm that centers rural strengths and complexities.

In practice, though, many rural areas do share structural constraints. They tend to have small local governments and budgets, fewer technical experts, and limited coastal hazard infrastructure (e.g. fewer flood defenses or drainage systems). Cohen & Greaney (2023) highlight that rural populations are aging faster. In the United States only about 15% live in rural areas, but they account for 22% of older Americans. This aging demographic can undermine community adaptive capacities. It is also common for younger populations to migrate away from rural areas in search of jobs with higher incomes and advancement opportunities, reducing local labor, skills, and the tax base. Rural communities are also more geographically isolated, meaning they face longer emergency response times, fewer evacuation routes, and greater difficulty accessing post-disaster recovery resources. This isolation is increasing as sea level rise and extreme storms threaten the transportation infrastructure that connect rural coastal areas (Best et al., 2023).

Many rural coastal communities face higher vulnerability to coastal hazards due to limited financial, technical, and social resources. The town of Nome, Alaska faces compounding infrastructure damage from permafrost thaw, coastal erosion, and declining sea ice, with aging infrastructure, high maintenance costs, and limited local capacity constraining the town's ability to adapt (Fitton et al., 2021). Fuvemeh, Ghana is an example of limited social and political resources shaping vulnerability, where a nearby, larger town was prioritized in the design of a regional coastal protection scheme over Fuvemeh's more pressing erosion risk (Fitton et al., 2021).

Rural coasts are uniquely exposed as well. In their case study of U.S. coastal rural adaptation, Jurjonas & Seekamp (2018) found that rural coastal economies depend on natural-resource livelihoods that are directly impacted by storms, flooding, erosion, and saltwater intrusion. For example, saltwater intrusion into estuaries and groundwater makes farmland and wetlands unusable, undermining agriculture and fisheries. In contrast, coastal cities may have diversified economies and more formal infrastructure.

These structural disadvantages are compounded by a bias in the adaptation research and planning intended to serve communities. Molnar (2010) argues that adaptation research and planning have been biased toward cities and national scales, often overlooking local rural needs. Magnan et al. (2023) provide recent evidence; their structured expert assessment shows coastal urban areas generally advance adaptation faster than rural ones. Jurjonas & Seekamp (2018) also contrast rural versus urban coasts, finding that urban coasts have growing populations, increasing property values, and extensive infrastructure at risk, but also more institutional capacity. Rural coasts, by contrast, have more dependency on natural resource sectors and reduced policy capacity. They found rural residents prioritized protecting fisheries and farms and securing jobs, whereas urban areas prioritized protecting dense housing and critical infrastructure. They introduced a Rural Coastal Community Resilience framework emphasizing local priorities rather than one-size-fits-all metrics. This reflects a broader theme, that rural communities often rely on social capital and traditional knowledge to adapt. In their comparative study of urban versus rural resilience in Taiwan, Su et al. (2022) find that rural areas emphasize traditional knowledge, resilience and self-reliance, whereas urban areas emphasize engineered infrastructure.

Despite these recognized differences, much remains unknown about how adaptation takes place within rural coastal communities on the ground and what effective adaptation looks like in

these environments. Rural coastal communities are underrepresented in adaptation research, there is a lack of systematic studies of adaptation progress in low-populated coasts. Much of the existing evidence on rural coastal adaptation, including several of the studies reviewed above, is drawn from international contexts or addresses coastal hazards broadly rather than erosion specifically, which limits how directly it can be applied to a case like North Cove. We also need a better understanding of how social factors influence adaptation choices, as these factors may matter more for explaining how a specific community organizes and adapts than, for example, population aging or poverty rates. For instance, it is unclear how aging demographics and poverty in rural areas affect the uptake of adaptation strategies. Few studies examine how to effectively build local planning capacity in these areas. Overall, more context-specific research is needed to identify what works in strengthening rural coastal resilience and how to integrate local strengths into adaptation planning. Understanding these dynamics is important because it will inform what kinds of support would actually be effective for rural coastal communities rather than support designed around urban and/or institutionally well-resourced cases.

These structural conditions have implications for how adaptive capacity should be conceptualized in rural coastal settings. Prominent adaptive frameworks such as Cinner et al. (2018) and Gupta et al. (2010) that have been developed in urban or developing country contexts may not adequately capture the ways that small populations, weak institutional capacity, and aging demographics constrain adaptive capacity. At the same time, coastal rural communities often have unique characteristics such as self-reliant values, traditional knowledge, and dense social ties that are frequently overlooked in adaptive capacity studies. Frameworks and empirical approaches designed for these contexts must account for both the unique constraints and strengths of rural coasts.

Community-Based Adaptation

Community-based adaptation (CBA) has gained prominence as an approach for rural and marginalized populations. Its core principle is that adaptation planning should be locally led and participatory. Ayers & Forsyth (2009) define CBA as aiming to strengthen the capacity of local people to adapt by using their own knowledge and decision-making processes. In practice, CBA projects involve communities in identifying vulnerabilities and solutions, integrating local knowledge, and ensuring interventions meet local needs. CBA “uses the principles of bottom-up and participatory adaptation to amplify local voices in decision-making” (Kirkby et al., 2018, p. 3) By engaging communities directly, CBA seeks to empower residents, build on existing social networks, and make adaptation strategies locally relevant and sustainable.

Community Engagement and Effective CBA

Community engagement, the participation of community members in the planning, implementing and sustaining of adaptation actions (Kirkby et al., 2018; Selje et al., 2024), is a critical pillar of CBA. Community engagement is shaped by social, psychological, and structural conditions. Residents engage more actively when they perceive a threat as personally salient, trust that their contributions will matter, are well-connected in the community, and have access to low-barrier opportunities to participate (Peng et al., 2020). Competing priorities, weak social ties, and exclusion from formal decision-making processes can limit participation even among residents who may support adaptation goals. Residents with strong social ties but no perceived personal stake in a hazard can be disengaged, as may be residents who are concerned about coastal hazards but lack low-barrier entry points (e.g. a volunteer role that aligns with their skillset or a nearby public meeting). Attention must be paid to how these conditions combine for

each individual resident, not simply whether each is present in a community overall. These dynamics suggest that effective CBA depends on understanding the conditions that enable residents to meaningfully engage with adaptation efforts.

Many CBA initiatives have been implemented to reduce climate hazards, notably documented in developing countries (Hagedoorn et al., 2019; Khanal et al., 2019; Westoby et al., 2020). For example, Hagedoorn et al. (2019) examined CBA initiatives in Kosrae, in the Federated States of Micronesia, and found that communities with higher levels of social capital, meaning denser networks of trust and reciprocity among residents, were better able to translate participatory planning into sustained adaptive action. Existing relationships lowered the coordination costs of organizing collective responses. Community engagement increases community buy-in and social capital and improves the effectiveness and creativity of projects (Kirkby et al., 2018). Kirkby et al. (2018), in their assessment of Pacific Island CBA initiatives, found that projects grounded in local leadership and iterative learning are more likely to be adapted to local conditions and sustained by residents after initial funding or facilitation ends. This suggests that CBA's core participatory principle, when implemented with community ownership in mind, can produce adaptation strategies that are both more locally appropriate and more durable than top-down alternatives.

Critiques and Limitations of CBA

However, CBA faces several critiques in scholarly literature. One key issue is power and politics. Yates (2014) argues that CBA is not apolitical just because it is local. Adaptation governance involves actors at multiple scales, and “the community” is rarely a unified group. Local elites and external agencies can dominate participatory processes and sideline

marginalized groups. Yates (2014) cautions that focusing solely on the community scale can ignore broader political-economic forces, such as land tenure systems that determine who has standing to participate in adaptation decisions, government funding priorities that shape which projects receive support, and market forces that determine which livelihoods are viable in the first place. These forces often originate outside the community and cannot be resolved simply through soliciting local participation. Yates (2014) stresses that equitable and effective adaptation cannot be achieved without acknowledging and addressing how power flows between individuals, households, and communities, since unaddressed power imbalances can lead to unfair outcomes for marginalized residents and undermine project effectiveness. CBA projects must attempt to address equity and fair representation, or they risk exacerbating existing inequalities.

Another gap is understanding the social mechanisms that support the long-term sustainability of community projects. Mills-Novoa (2023) highlights that many CBA projects are short-term and donor-funded. She finds that even projects seen as highly successful at their end often have uncertain futures once funding stops. Planned sustainability measures, such as local committees or maintenance funds, frequently fail to materialize, leaving communities to carry on burdens they may not be equipped to manage. This raises questions about the long-term viability of CBA initiatives and how communities maintain momentum without external support. Linked to this, Selje et al. (2024) note that CBA's benefits are rarely rigorously evaluated.

While CBA aligns well with the rural context, since it leverages local knowledge and social capital, its practice clashes with constraints such as unequal influence and funding discontinuities. Critics argue that calling a project “community-based” does not automatically

solve these problems, and that careful attention to governance and to the post-project phase is needed (Mills-Novoa, 2023).

Overall, literature on CBA in rural coastal settings reveals gaps around measuring impact and integrating with policy. Few studies track CBA outcomes years after implementation (Mills-Novoa, 2023), and there is limited guidance on scaling community-led projects into regional or state adaptation plans. The literature also lacks clear metrics for success that reflect community priorities. More research is needed on how to link local CBA efforts with broader coastal management, including marine and development planning, and how to fund long-term community resilience. As Selje et al. (2024) conclude, CBA has promise but requires deeper theory and practical frameworks to truly empower communities and address power imbalances.

Adaptive Capacity: Frameworks, Linkages, Critiques and Gaps

Defining Adaptive Capacity

Adaptive capacity emerged as a central concept in climate change research in the late twentieth century and was brought to the forefront of research and policy by the IPCC's 2001 Third Assessment Report (IPCC, 2001). This thesis defines adaptive capacity, following Smit and Wandel (2006) and Engle (2011), as the ability of a system—whether an individual, household, community, or institution—to adjust to environmental change, moderate potential damages, take advantage of opportunities, and cope with its consequences. This definition spans multiple scales of analysis, and the sections that follow move between individual, household, and community scales, reflecting the literature on adaptive capacity and the ways that processes at one scale can shape capacities at another. For example, individual knowledge, resources, and perceptions can influence household and community responses, while community institutions and social relationships can shape the opportunities available to individuals.

Although adaptive capacity was initially conceptualized primarily in terms of biophysical conditions and material resources, subsequent scholarship increasingly emphasized its social and political dimensions. Early approaches and IPCC assessments focused largely on exposure and sensitivity to climate stimuli and on the resources available to cope with their impacts (IPCC, 2001). As the literature expanded in the early 2000s, scholars argued that adaptation is highly context-specific and shaped by socio-political and cultural conditions (Thomas et al. 2019). Bassett and Fogelman (2013) found that much of the early adaptation literature and IPCC assessments treated adaptation as an apolitical adjustment to a physical stressor, giving limited attention to the social roots of vulnerability. Similarly, Beck (2011) critiqued the IPCC's early linear model of expertise for underrepresenting the social and political dimensions of adaptation. These critiques shifted attention toward the ways that power, knowledge, institutions, and access to resources shape who is able to adapt and how. Adaptive capacity therefore came to be understood as a socially and politically mediated set of capabilities that determines how resources can be mobilized in response to environmental change.

This broader understanding also makes adaptive capacity a useful framing for both researchers and practitioners because it identifies capacities that can potentially be strengthened through policy and intervention (Engle, 2011). Adaptive capacity differs from related concepts such as resilience, which can describe a system's ability to persist or absorb disturbance regardless of whether that persistence is desirable. For example, a system may be highly resilient in maintaining an existing social or political arrangement even when that arrangement produces undesirable outcomes. Adaptive capacity, by contrast, focuses more directly on the ability to adjust to environmental change and therefore provides a more straightforward target for interventions intended to improve adaptation (Engle, 2011). This distinction is particularly useful

for examining rural communities facing persistent environmental change, where the question is not simply whether a community persists, but what enables it to modify existing practices, mobilize resources, and pursue new responses.

As interest in adaptive capacity grew, a range of frameworks emerged to summarize its characteristics. Early approaches such as the Sustainable Livelihoods Approach (SLA), first articulated by Chambers and Conway (1992), defined a livelihood as comprising assets and the capabilities needed to put those assets to use. This rests on the same foundation as Sen's (1999) capabilities approach, which holds that wellbeing depends less on the resources a person holds than on their freedom to use them. Attention to capabilities has since been expanded with dimensions like innovation, technology, information, and governance (Chapagain et al., 2025). Building on critiques that adaptation cannot be reduced to access to assets alone, Cinner et al. (2018) introduced a five-domain framework that centered assets, flexibility, social organization, learning, and agency. Domains here refer to a distinct category of resource or capability a community draws on to respond to environmental change. This framework was later extended to incorporate socio-cognitive dimensions such as risk perception and social norms (Cinner & Barnes, 2019). Another prominent framing, the Adaptive Capacity Wheel, emphasizes the role of institutions in facilitating adaptive capacity, through dimensions of leadership, resources, fair governance, variety, learning capacity, and room for autonomous change (Gupta et al., 2010). In this framework, institutions enhance adaptive capacity by having competent leaders, adequate funding, transparent decision-making, diverse adaptive strategies, opportunities to experiment and learn, and space for local innovations. Gupta's framework underscores how local leadership and political context underpin all other capacities.

Across these frameworks, adaptive capacity comprises both tangible and intangible factors. Material assets and infrastructure (e.g. diversified livelihoods, robust transportation, savings) are vital, but so are social and cognitive dimensions. Recent empirical studies illustrate this interplay. Barnes et al. (2025) use social network analysis in Kenyan fishing villages to enrich the agency domain. They show that adaptive agency often flows through network ties, since individuals connected to community leaders or resource holders become more able to influence adaptation decisions. This highlights social position shapes both agency and learning. Network brokers spread information, and hence expand others' learning and confidence to adapt. Similarly, Taylor et al. (2021) found that wealthier, more connected fishing communities can diversify harvests better, linking assets and flexibility.

On the socio-cognitive side, some research has studied how psychological and cultural factors link with adaptive capacity, building on foundational work by Grothmann & Patt (2005), who modeled individual adaptation to climate change as a function of both objective capacity and perceived capacity to act. For example, Bartelet et al. (2023) quantitatively assessed reef tourism businesses and included indicators of self-efficacy ("adaptation confidence") and place attachment. They found that individuals who were more confident in their own adaptive abilities tended paradoxically to pursue fewer transformative actions after a climate shock. This suggests that high self-efficacy can sometimes reduce perceived need for change if people think they can handle things as they are. Sutcliffe et al. (2025), studying Kenyan fishing communities' responses to COVID-19, found that leaders' and individuals' perceptions of risk and responsibility directly shaped outcomes. In communities where leaders believed the pandemic posed minimal risk and emphasized self-reliance, external aid was not mobilized. Where leaders perceived high risk and took responsibility, they used personal networks to distribute food and

resources. These findings illustrate socio-cognitive linkages, showing how leaders' beliefs about risk and responsibility influenced how social organization and assets were used.

Adaptive capacity is multi-dimensional. Structural factors (e.g. assets, infrastructure, institutions) provide material potential, social factors (organizations, relationships, social norms) moderate collective action, and cognitive factors (knowledge, beliefs, values) determine how and whether action is taken. These domains do not act in isolation. As the studies reviewed above illustrate, simply having ample assets can be insufficient without learning and organization, and strong social networks mean little if community members do not perceive risk or have the freedom to act (Barnes et al., 2025; Sutcliffe et al., 2025).

Linkages Between Adaptive Capacity Domains

A key insight from recent work is that certain factors, notably local leadership and efficacy, operate across multiple domains and link them together. Linkages refer to factors that shape how two or more domains interact, for example, by determining whether the assets a community holds actually translate into the flexibility to use them. Local leadership in rural coasts has been shown to amplify several adaptive capacity domains simultaneously. Gisevius et al. (2025) directly measured the influence of community leaders in Indonesian coastal villages. They found that effective leaders significantly increased most Cinner et al. (2018) domains of adaptive capacity. Specifically, leaders built up social capital (social organization), organized collective action (agency), facilitated knowledge exchange (learning), managed community funds (assets), and represented community interests to outsiders (Gisevius et al., 2025). Leaders' ability to broker networks gave them disproportionate influence. They connected households to government programs, NGO training, and financial resources. Local leaders linked residents to assets and information while rallying social networks around adaptation goals.

Other studies exemplify this bridging role of leaders. Sutcliffe et al. (2025) describe how community leaders in Kenya mediated the interplay of social and cognitive factors during the COVID crisis. They report that leaders' perceptions of risk and responsibility directly affected whether aid and information flowed. In one case, a leader tapped external expert networks to provide accurate information and support, which shifted community risk perceptions and motivated preventative behaviors. Conversely, in a village where the leader underestimated the threat, people did not receive timely aid because the leader did not use their networks or authority to mobilize resources. These examples show that leadership shapes socio-cognitive constructs as well as social organization, connecting cognitive readiness to tangible support.

Similarly, social network-driven agency further connects domains. Barnes et al. (2025) demonstrate that individuals' sense of agency "ripples" through social networks. In five Kenyan fishing communities, decision-making power was concentrated among elders and community leaders, but those who were socially connected to these power holders gained influence over time. In other words, social organization determined who had the power (agency) to participate in adaptation planning. This finding underscores that leadership and agency are entwined, since being linked to a leader can give a person more decision-making power.

Efficacy beliefs (self and collective efficacy) are another linkage. Individuals' belief in their own ability to adapt (self-efficacy) and their community's ability (collective efficacy) can affect how the other domains play out. Much of the literature on adaptation decision-making draws on Ajzen's (1991) Theory of Planned Behavior, in which perceived behavioral control, a construct closely related to self-efficacy, is one of three factors determining whether intentions translate into action.

Barnett et al. (2021) argue that strengthening a group's shared identity is crucial; adaptation is more successful when people have confidence in their community's continuity and believe in their group's capability. Conversely, Bartelet et al. (2023) observed that businesses with lower adaptation confidence (self-efficacy) were more likely to take transformative actions, while confident actors saw less need to transform and often chose a coping strategy. This finding runs counter to the dominant consensus around Bandura's social-cognitive theory (Bandura, 1986), which assumes higher efficacy produces greater motivation to act. Bartelet et al. suggest this paradox may be explained by the distinction between incremental and transformative adaptation responses (Kates et al., 2012). Confident actors may feel capable of managing current conditions through familiar, incremental adjustments or coping, reducing their perceived need for the more disruptive transformative changes that severe environmental hazards sometimes require. This suggests that high perceived efficacy may dampen or strengthen the flexibility dimension depending on the context and is an important linkage for social organization and agency.

These studies show that local leadership and efficacy beliefs are connective mechanisms that determine whether assets, flexibility, social organization, and learning translate into agency and adaptive outcomes on the ground. Yet this empirical foundation is limited. The proliferation of theoretical adaptive capacity research has resulted in fragmentation and lack of clarity about its applicability to on-the-ground contexts (Siders, 2019). Empirical work, meanwhile, has been dominated by quantitative approaches that generate broad policy recommendations disconnected from actual decision-making processes (Chapagain, 2025; Vallury et al., 2022).

Much of the qualitative work that does examine how these linkages function in practice, including several of the studies discussed above, is concentrated in a small number of contexts.

Most of it comes from small-scale fisheries communities and several recent studies set in Kenya (Barnes et al., 2025; Sutcliffe et al., 2025), limiting how confidently these findings can be generalized to other rural or coastal settings (Green et al., 2021). Cinner et al. (2018) themselves note that linkages among adaptive capacity domains are poorly understood and call for research that examines how these domains interact on the ground. Gisevius et al. (2025) and Barnes et al. (2025) have begun to answer that call, but it remains largely unaddressed outside of fisheries and disaster-response contexts. Bartelet et al. (2023), for instance, examine self-efficacy and place attachment but do not address collective efficacy, and Sutcliffe et al. (2025) find that socio-cognitive factors are entangled with leadership and asset access but remain, on the whole, understudied.

This body of work establishes that leadership and efficacy are the clearest candidate linkages between adaptive capacity domains identified in the literature to date, but it has not yet examined how these two constructs jointly operate within a single rural coastal community, the gap this thesis addresses.

Critiques of Adaptive Capacity and Gaps

The literature surveyed above points to some interrelated gaps in the field. First, to our knowledge qualitative, community-level case studies that empirically examine linkages between adaptive capacity dimensions are limited. Second, existing frameworks call for deeper attention to the social processes that connect adaptive capacity domains, but these connections have rarely been studied on the ground. Third, there is limited empirical work examining the intersection of collective efficacy and local leadership in a single community context, a pairing that may be

particularly important for explaining how resource-constrained communities self-organize and mobilize.

Efficacy: Definitions, Distinctions and Connections to Adaptive Capacity

According to Bandura (1997a, p. 2), self-efficacy refers to “the belief in one’s capabilities to organize and execute the courses of action required to manage prospective situations.” In other words, self-efficacy is confidence in one’s capacity to influence events and solve problems through one’s own efforts. Bandura extended this concept to groups, defining collective efficacy as “a group’s shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments” (Bandura, 1997b, p. 477). Collective efficacy reflects the confidence of a community or team in its joint ability to tackle challenges together. When a group shares a strong belief that they can overcome obstacles together, the group tends to perform more effectively.

This section proceeds in three parts. It first reviews self-efficacy and collective efficacy in an adaptation context, then identifies a significant gap in research on collective efficacy in North American coastal contexts specifically. Next efficacy is connected back to the adaptive capacity domains reviewed in the previous section, arguing that efficacy functions as a linkage that shapes whether the other domains are actually mobilized into adaptive action.

It is important to distinguish efficacy (perceived capacity) from agency (actual capacity). Efficacy is a belief of what people think they can do, whereas agency refers to what people are able to do given real-world constraints. In the context of adaptation, Cinner et al. (2018), p. 20, define agency as “the ability of people to have free choice in responding to environmental

change.” Bandura notes that self-efficacy beliefs are the foundation of human agency, and that confidence in one’s own capability is a key driver of taking action.

Self-Efficacy

At the individual level, research has shown that high self-efficacy relates to greater engagement in adaptation and disaster-risk activities (Peng et al., 2020). This individual-level construct is the starting point for understanding efficacy’s role in adaptive capacity, since collective efficacy, discussed in the following section, is partly an aggregation of these individual beliefs. Numerous studies have linked greater confidence with higher likelihood of participation (Peng et al., 2020; Navarro et al., 2021). For instance, Peng et al. (2020) found that among rural Chinese farmers, individuals with higher self-efficacy were more likely to take part in community-based disaster management programs. In their model, self-efficacy amplified the positive effect of social trust on participation; when farmers believed in their personal capabilities, trust in their neighbors translated more strongly into actual involvement in preparedness activities (Peng et al., 2020). Navarro et al., (2021) integrated self-efficacy into a coastal risk context, arguing that individuals’ motivation to protect themselves against coastal erosion and/or flooding depends not only on how severe they judge the threat, but also on their belief in their ability to carry out the protective response.

Self-efficacy is often constrained by personal circumstances such as time, health, and information access, mirroring the structural limitations common in rural communities. Although empirical studies seldom focus explicitly on factors like time or health, qualitative evidence suggests that these limitations often hinder engagement (Bruley et al., 2026). For example, a smallholder farmer who is in poor health or engages in heavy subsistence work may lack both

the time and energy to attend meetings or implement new practices, even if they believe it would help. Also, limited education or information can keep people from feeling confident (Bruley et al., 2026). Without knowledge of what actions to take, self-efficacy stays low (Peng et al., 2020). Even individuals who conceptually support adaptation may be unable to act unless they also have adequate time, health, and understanding (Bruley et al., 2026). In rural communities, it is important to better understand how barriers to participation relate to residents' self-efficacy.

Collective Efficacy

This section reviews how collective efficacy is shaped by the shared beliefs and social dynamics of a community. When groups of people trust that their combined efforts can overcome challenges, their collective performance improves (Bandura, 1997b). Collective efficacy is often underpinned by social cohesion, trust, and shared experiences (Bandura, 1997b).

Empirical studies support the importance of collective efficacy for adaptation outcomes. Thaker et al. (2016) analyzed survey data from over 4,000 Indian households facing water scarcity and found that collective efficacy was strongly linked to adaptive behavior. Individuals who perceived high collective efficacy in their communities were significantly more likely to participate in community efforts to ensure sufficient water supplies, and overall community-level collective efficacy was positively associated with reported adaptation measures (like rainwater harvesting or water-sharing agreements). Villages with high shared confidence enacted more adaptive responses to drought. Where collective efficacy is low, communities struggle to organize. Ayal et al. (2021) show this in rural Ethiopia, where persistent drought has left farmers with very low collective efficacy. The study found that repeated climate shocks eroded farmers'

confidence in their collective ability to cope, which limited their community adaptation efforts were limited.

When neighbors trust and feel that they can rely on one another, they develop stronger collective efficacy and are more willing to pool resources and organize adaptation practices (Hudson et al., 2020; Thaker et al., 2016). Conversely, a decline in social trust or shared purpose over time can undermine collective efficacy and stall collective action (Ayal et al., 2021). Recognizing this, some scholars argue that fostering social capital is a vital component of adaptation planning (Hagedoorn et al., 2019). Mzimela and Moyo (2023) found that studies on collective efficacy and climate adaptation remained very scarce. Only eight such studies globally met their inclusion criteria, and all focused on developing countries. This lack of research was especially notable given the relevance of collective efficacy to rural coastal communities in the United States, none of which, to this author's knowledge, have been directly studied in this respect.

Efficacy as Linkage Within Adaptive Capacity

Self-efficacy is shaped by past experiences (Bandura, 1997a). Every successful protective action (e.g. building a dune that survives storms) can reinforce individuals' confidence, making future adaptation easier. Repeated setbacks can erode self-efficacy and discourage future participation. Navarro et al. (2021) showed that individuals' intention to undertake protective behaviors depends both on how much threat they perceive and how much they believe in their own coping ability. In flood-prone central Vietnam, Hudson et al. (2020) found that social capital and self-efficacy reinforce each other. Communities with strong social cohesion not only perceive greater risk but also report higher self-efficacy. Peng et al. (2020) demonstrate that greater self-efficacy magnifies the positive impact of social trust on participation.

Efficacy is an important linkage between adaptive capacity dimensions (Cinner & Barnes, 2019). Bandura (2000) situates perceived efficacy as foundational to agency, arguing that without believing that one's actions can produce a desired effect, a person will have little incentive to try, regardless of what resources they have. Efficacy may also influence communities' assets, flexibility, organization, and learning. Mapping this connection onto each of the five domains shows where the evidence is strong and where it is limited. In the assets domain, efficacy shapes whether individuals and communities actively seek out resources and opportunities, and high collective efficacy is associated with greater resource mobilization (Thaker et al., 2016). The flexibility domain has more direct empirical support than the other linkages discussed in this section. Delaney et al. (2026) found that farmers participating in an integrated technical, experiential, and social climate adaptation program reported increased self-efficacy, developed through iterative experimentation and social learning alongside peers. This suggests that efficacy and flexibility may be mutually reinforcing, since experimentation builds confidence and confidence supports further experimentation, though this relationship has not yet been examined in a coastal adaptation context specifically, a gap this thesis begins to address. Collective efficacy and social organization reinforce each other. Communities with stronger trust develop higher shared confidence, which in turn supports coordinated action (Hudson et al., 2020). In the learning domain, self-efficacy has been linked to more active information-seeking behavior in health and environmental risk contexts (Grothmann & Patt, 2005), suggesting a plausible extension to adaptive learning, though this specific link has not been tested directly in coastal or rural adaptation research. And in the agency domain, efficacy may be a critical precursor, though this claim is also largely theoretical based on the literature reviewed here. Without one's belief that they can make a difference, their freedom to act may not be mobilized.

The assets and social organization linkages rest on relatively direct empirical support, while the flexibility, learning, and agency linkages are more speculative extensions from adjacent literatures. Clarifying which of these linkages hold, and how, in a single rural coastal community is the specific contribution this thesis makes to the adaptive capacity literature reviewed in this chapter.

Adaptation Governance: The Importance of Local Leaders

This section turns from efficacy to a second social construct central to this thesis, local leadership. The section is split into three parts. It first defines local leaders and situates them within the broader landscape of rural coastal adaptation governance. It then draws on the boundary spanning literature (Tushman, 1977; Bednarek et al., 2018) to formally characterize the cross-scale bridging role local leaders play, and connects this mechanism explicitly to the Cinner et al. (2018) adaptive capacity domains. It closes by identifying two gaps in the literature, the understudied role of leaders as boundary spanners in U.S. rural coastal contexts specifically, and the poorly understood motivations that drive leaders to act, both of which this thesis addresses directly.

Rural coastal adaptation in the United States is governed within a complex multi-scale social network of individuals, organizations, and governments. Within this network, local leaders (informal and formal leaders that live and work in the area impacted by coastal hazards) are known to be critical nodes in the adaptation process (Meijerink et al., 2015; Gisevius et al., 2025). Formal leaders include elected officials, planners, and agency staff, while informal leaders can be community organizers, long-time residents, traditional knowledge holders, or activists. In rural coastal settings where formal institutions may have a limited presence, informal

leaders often step in to build social capital (Liu & Han, 2023; Bodin & Crona, 2008). Liu and Han (2023) identified rural community leaders as those who lead by example, mobilize and organize neighbors, and command reputation and credibility, all of which positively influence local governance.

Local leaders can carry both informal and formal responsibilities in the community (Gisevius et al., 2025). In rural areas with threatening coastal hazards, leaders with positional decision-making status may also utilize personal connections to enable community adaptation. Community leaders draw from personal social networks connected through trust, knowledge, affect, and other ties to exercise their influence under structural constraints (Barnes et al., 2025).

The bridging function local leaders perform across these roles has a formal name in the organizational and science-policy literature, boundary spanning, the activity of linking a system's internal actors to external sources of information, resources, and legitimacy (Tushman, 1977). Bednarek et al. (2018) extend this concept to environmental governance specifically, arguing that effective boundary spanners combine technical credibility with social trust on both sides of the boundary they cross, neither functioning well without the other. This dual competency is visible across the empirical leadership literature already reviewed above, though rarely named as such. Effective leaders raise funds (through external grants or local fundraising), disseminate knowledge, and rally volunteers for grassroots projects (Gisevius et al., 2025). For example, Bezboruah et al. (2024) showed how a resident-led nonprofit in a small Texas bay town bolstered its flood resilience. The Ingleside on the Bay Coastal Watch Association (IOBCWA) improved the community's adaptive capacity through organizing meetings, advocating for planning, collecting data on flood risk, building local preparedness skills, and building communication networks to neighboring towns. In boundary spanning terms, IOBCWA's leaders were

simultaneously managing the technical side of the boundary, flood risk data and preparedness skills, and the relational side, communication networks and trust with neighboring towns and federal emergency managers, exactly the combination Bednarek et al. identify as necessary for effective spanning. Liu and Han (2023) found that community leaders in Chinese villages significantly contribute positively to rural environmental governance by mobilizing collective action and building local support for adaptation policies. They describe rural leaders as those who serve as the key bridge connecting top-down requirements, external resources, and bottom-up community collective actions. This description maps closely onto Tushman's original account of boundary spanners as the individuals who gather information from external domains and transmit it back into a system that could not access it directly on its own. Gisevius et al. (2025) likewise emphasized leaders' broker roles in linking neighborhood networks with formal disaster management processes, and Moser et al. (2012) document rural leaders translating technical project information for their communities and local knowledge back to agencies. Read together through a boundary spanning lens, these studies converge on a single underlying mechanism: local leaders occupy a structural position between community and institution that lets them move resources, knowledge, and legitimacy in both directions, a mechanism this thesis treats as the organizing framework for interpreting local leadership in North Cove.

Our understanding of the mechanisms through which leaders influence their communities' adaptation can be deepened when connected to adaptive capacity domains. In the assets domain, leaders mobilize financial and technical resources through grant writing, fundraising, and cultivating relationships with external agencies (Bezboruah et al., 2024; Gisevius et al., 2025). In the flexibility domain, leaders create conditions for experimentation by encouraging regulatory flexibility and championing novel approaches that the community can

trial without external buy-in (Gisevius et al., 2025). In the social organization domain, leaders are primary nodes in social networks within their communities and between their communities and governments (Liu & Han, 2023; Barnes et al., 2025). In the learning domain, leaders translate technical information for their communities and local knowledge for agencies (Moser et al., 2012; Gisevius et al., 2025). And in the agency domain, leaders build residents' sense of empowerment and structural capacity through advertising the visible success of their work and creating opportunities to contribute (Gisevius et al., 2025). Local leadership is critical for connecting and activating these dimensions of adaptive capacity.

Despite growing recognition of leadership's importance in empirical and theoretical work, an important gap remain. The role of local leaders in U.S. rural coastal adaptation contexts is understudied. This matters because leadership dynamics observed in urban or Global South settings may not transfer cleanly to U.S. rural coastal communities, which face a distinct combination of structural constraints, limited government capacity, geographic isolation, and resource-dependent economies that likely shape how and why leaders emerge and act. Without context-specific research, adaptation programs risk importing lessons from settings where the underlying conditions do not match. Much adaptation research focuses on urban or Global South communities (Magnan et al., 2023), and U.S. case studies often emphasize technical planning or public participation without zooming in on individual leadership. A growing body of work on rural Puerto Rico offers a partial counterexample. Roque et al. (2025) documented how community leaders in Corcovada, a rural community in western Puerto Rico, became de facto first responders navigating cascading food, energy, and water insecurities amid what the authors describe as chronic state negligence and infrastructural degradation. This work suggests that U.S. rural leadership dynamics are not entirely unstudied, but that this literature remains

geographically concentrated, largely disaster-response focused, and has not yet extended to the specific context of rural coastal erosion.

Synthesis

Figure 1: Conceptual diagram of local leadership, collective efficacy, and adaptive capacity in rural coastal adaptation

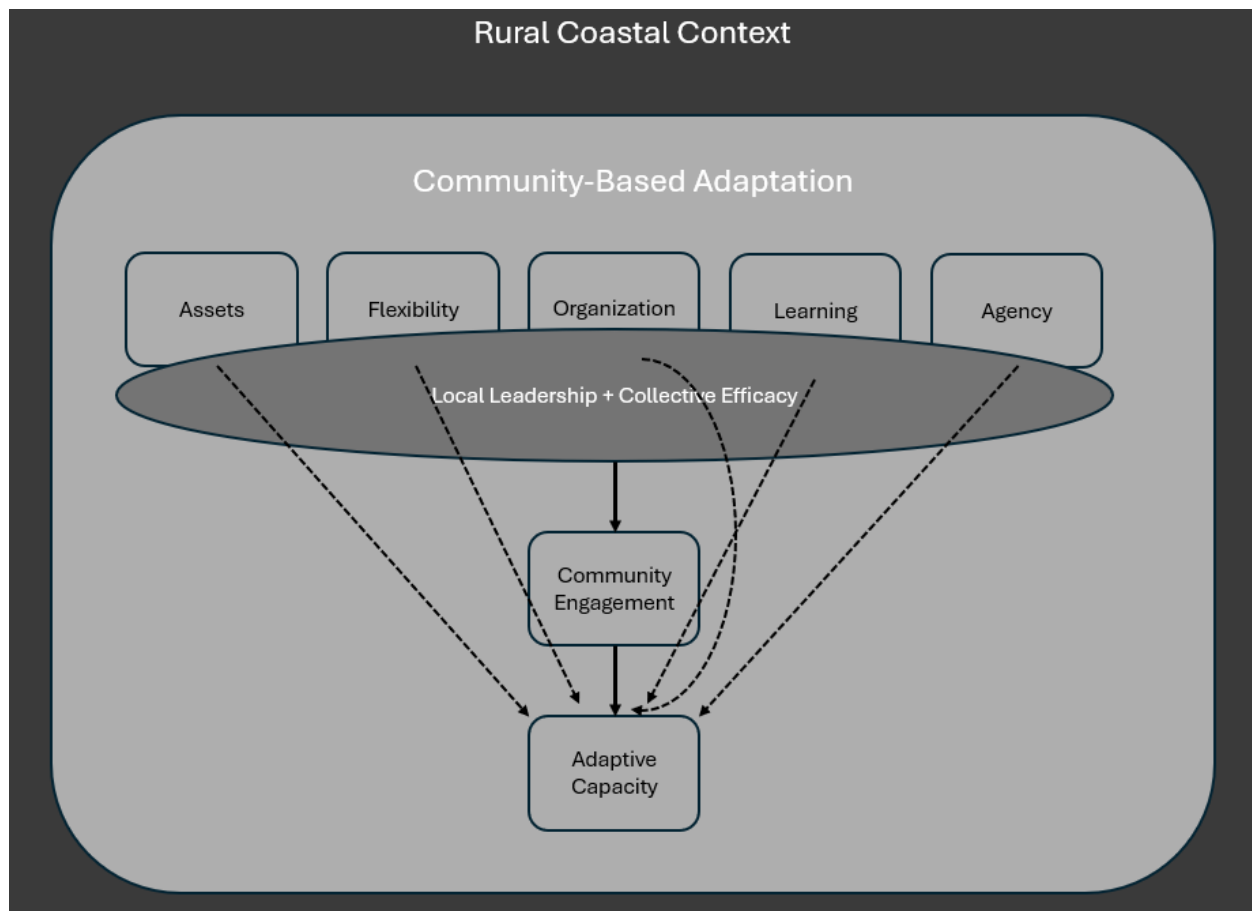


Figure 1 synthesizes the relationships this chapter has developed across five bodies of literature. Rural coastal communities face structural constraints that differentiate them from urban contexts, including limited government capacity, aging populations, and resource-

dependent economies (Magnan et al., 2023; Jurjonas & Seekamp, 2018). Within that context, community-based adaptation offers a promising but conditional approach, one whose success depends on governance quality and community cohesion that cannot be assumed (Yates, 2014; Mills-Novoa, 2023). Nested within this approach are the five domains of adaptive capacity identified by Cinner et al. (2018): assets, flexibility, social organization, learning, and agency, which describe what a community needs to respond to environmental change but not how those needs get met in practice.

Local leaders, understood through the boundary spanning literature (Tushman, 1977; Bednarek et al., 2018), shape each of the five domains individually. They mobilize assets through grant writing and fundraising, create room for flexibility by championing novel approaches, build social organization by bridging disconnected groups, enable learning by translating knowledge across institutional boundaries, and build agency by demonstrating to residents that their contributions matter (Gisevius et al., 2025; Liu & Han, 2023). Collective efficacy is another parallel linkage. When residents share confidence in their community's collective capacity, they are more likely to seek out resources, experiment with new approaches, coordinate with one another, apply new knowledge, and exercise the agency available to them. When collective efficacy is low, adaptive capacity may remain dormant even when the material conditions for it exist (Thaker et al., 2016; Hudson et al., 2020).

Community engagement is shaped by leadership and collective efficacy. Leaders create the low-barrier opportunities that make engagement possible, and collective efficacy shapes residents' willingness to take them up, but engagement and the five domains both feed independently into a community's overall adaptive capacity.

Despite the centrality of these two constructs to the model, both remain empirically underdeveloped in exactly the setting this thesis examines. Leadership motivations and strategies are poorly understood in U.S. rural coastal contexts specifically (Gisevius et al., 2025; Liu & Han, 2023), and collective efficacy research in coastal adaptation remains rare outside the Global South (Mzimela & Moyo, 2023). The case study that follows addresses both gaps directly, examining how local leadership and collective efficacy jointly shape adaptive capacity in a single rural coastal community.

Chapter 3: Social Processes and Adaptive Capacity in North Cove, WA: A Case Study of Rural, Coastal Adaptation to Severe Erosion

Introduction

Rural coastal communities worldwide face accelerating exposure to erosion, storms, and sea level rise, yet their capacity to respond to these threats is not reducible to the physical severity of the hazard itself. Adaptive capacity, a system's ability to adjust, moderate harm, and take advantage of opportunities in the face of environmental change, has traditionally been assessed through biophysical and material indicators such as the resources a community holds, the infrastructure it has built, and the institutions available to support it (Adger, 2006; Smit and Wandel, 2006). Yet a growing body of scholarship argues that this framing, on its own, is insufficient. Social, psychological, and political dynamics shape whether the resources a community has are ever mobilized at all, including who leads a community's response, whether residents believe collective action can succeed, and how effectively local knowledge moves between community and institution (Adger, 2006; Cinner et al., 2018). Understanding adaptive capacity in rural coastal communities therefore requires attention not only to what a community has, but to the social processes that determine whether what it has gets used.

This distinction matters most in exactly the communities that existing frameworks describe least well: small, resource-limited, and institutionally thin rural coastal communities. Rural coasts face structural constraints that differentiate them from urban ones, including limited government capacity, aging populations, and resource-dependent economies (Jurjonas & Seekamp, 2018; Magnan et al., 2023), and these same constraints shape which social processes are available to a community and which are not. Cinner et al. (2018) offer one influential framework for organizing this complexity, identifying five domains through which communities build adaptive capacity: assets, flexibility, social organization, learning, and agency. Two constructs cut across these domains, building all of them. Local leaders, understood through the boundary spanning literature as individuals who connect a system's internal actors to external resources, knowledge, and legitimacy (Tushman, 1977; Bednarek et al., 2018), have been identified as critical nodes in adaptation networks, bridging residents with resources, translating technical information, and mobilizing community-level action (Gisevius et al., 2025; Liu & Han, 2023). Collective efficacy, a community's shared belief in its joint capacity to act (Bandura, 1997b), shapes whether the assets, flexibility, and social organization a community holds are actually drawn upon (Thaker et al., 2016). The interaction between what leaders do and what residents are willing to do given their own circumstances is the central social dynamic this thesis examines in North Cove.

Despite the theoretical importance of both constructs, significant gaps remain in understanding how they function empirically, particularly in the specific setting of rural, coastal, under-resourced communities in the United States. These gaps go beyond a general call for more social science research. What remains poorly understood is, specifically, how such communities move from adaptation, meaning the concrete, historical actions a community has already taken in response to a hazard, to adaptive capacity, meaning its ongoing and future potential to respond as

conditions continue to change. Leadership motivations and strategies remain understudied in U.S. rural coastal contexts specifically (Gisevius et al., 2025; Liu & Han, 2023), and collective efficacy research in coastal adaptation remains rare outside the Global South (Mzimela & Moyo, 2023). Without empirical attention to these constructs in a rural U.S. coastal setting, it remains unclear whether the mechanisms identified in other contexts, including disaster response in Kenya, water scarcity in India, and small-scale fisheries in the Global South, operate the same way where formal government presence is minimal and the hazard is slow-moving rather than acute.

This gap is especially pressing along the Washington coast. Washington coasts are being increasingly threatened by natural hazards, including but not limited to erosion, extreme storms, and tsunamis (Reeder et al., 2013). Parts of southern Washington are rapidly eroding, and communities are facing the loss of critical infrastructure and homes (Hart, 2024). Sea-level rise and land use intensify these risks (Reeder et al., 2013). These hazards are compounded by the socioeconomic and governance challenges unique to rural, unincorporated communities. Rural communities have limited access to technical and financial resources for adaptation projects (Nelson et al., 2023). Residents are often more focused on their daily operations than long-term climate threats, which constrains their ability to engage in adaptation planning (Raymond et al., 2013). Unincorporated communities often lack political representation, making it harder for them to advocate for government assistance (Gomez-Vidal & Gomez, 2021). The administrative structure of a place significantly affects how hazard mitigation efforts unfold, putting unincorporated communities at a disadvantage (Saavedra, 2009). These challenges can affect the adaptive capacity of rural communities to withstand environmental threats. Recent scholarship on locally led adaptation has argued that shifting power and decision-making authority to the

local level, rather than treating communities as recipients of externally designed interventions, tends to produce more effective and contextually appropriate outcomes, while also cautioning that this shift is difficult to achieve in practice and that “local” itself remains a contested and often poorly defined category (Rahman et al., 2023).

North Cove, Washington is a case one might not expect to successfully adapt. The community is situated along one of the most rapidly eroding shorelines on the U.S. Pacific coast, facing the same resource constraints, competing daily priorities, and limited political representation common to unincorporated rural communities described above. With no formal municipal government of its own, the combination of conditions that a purely hazards-based framework would predict as producing high vulnerability and little capacity for organized response (Adger, 2006). In the absence of external support, community members have relied on improvised and volunteer-based approaches to mitigate the erosion. Since 2016, locally-led projects have not only slowed the erosion but have extended the coastline seaward (Bayle et al., 2021), work that has since drawn sustained national and international press coverage (Bengel, 2022). This mismatch, a community succeeding under conditions where existing theory would expect it to struggle, is what makes North Cove a valuable case for examining how social processes shape adaptive capacity in practice. A fuller account of the community’s history, geography, and demographic context is provided in the Study Area and Population section below.

Specifically, this research investigates:

What are the social processes that support or limit North Cove’s adaptation to coastal erosion?

Through a qualitative case study of community members' and practitioners' experiences with erosion and adaptation, this chapter examines the social processes, including local leadership and collective efficacy, that have shaped North Cove's response to coastal erosion. In the sections that follow, I first describe the study area, research design, and methods used to investigate this question. I then present findings organized around the social processes identified in the data, before discussing how these findings relate to, extend, and complicate the literature reviewed in Chapter 2. I argue that in a rural community with limited formal institutional capacity like North Cove, adaptive capacity is concentrated in and activated through the boundary-spanning work of a small number of local leaders and the community's perceived collective efficacy, and that understanding this concentration is essential to understanding both the community's past adaptation and its ongoing capacity to respond to erosion.

Research Approach and Methods

Study Area and Population

The research is situated in North Cove, a small, unincorporated coastal community in Pacific County, Washington, located on the north shore of Willapa Bay (Figure 2). Since the 1930's, the ocean has consumed 160 structures and eroded an average of 50 to 100 feet of coastline every year (DiCarlo, 2026). The current population includes cranberry farmers, long-term homeowners, retirees, summer vacationers, and unhoused people (Pacific County, 2021), many of whom have direct experience with shoreline change and local mitigation efforts (DiCarlo, 2026). Adaptation responses have increased in the last decade, ranging from local and state government-funded shoreline armorings to community-led dune grass plantings (Hart,

2024). Local community organizations have been central actors, advocating for change and fostering community engagement in grassroots projects.

Figure 2: Geographic location of North Cove, WA on the western United States



The community was established in 1884 following the construction of a lighthouse and coast guard station to protect sailors during the California Gold Rush and timber trade (Allen et al., 2022). Both structures were lost to the ocean, in 1940 and 1950 respectively (Balderas Gúzman et al., 2025). North Cove neighbors the Shoalwater Bay Indian Reservation, home to the Shoalwater Bay Indian Tribe, a federally recognized tribe of Lower Chehalis and Willapa Chinook descent whose reservation was established by presidential executive order in 1866, decades before North Cove itself was settled. The Tribe, whose land similarly faces chronic shoreline erosion along the Willapa Bay entrance, is a longstanding presence in the region and,

as discussed in the Results, has played a significant role in the erosion-mitigation efforts examined in this study.

In the early 1960s, North Cove encompassed 766 private parcels of land with a post office, school, hotel, and a number of other businesses (Cowdrey, 2020). Around this same time, erosion began accelerating dramatically due to the dredging and damming of the Columbia River, which the surrounding coastlines relied on for sediment deposition (Gelfenbaum & Kaminsky, 2010). The shoreline at the entrance to Willapa Bay is shaped by a roughly 13- to 20-year cycle in which the deep-water tidal channel connecting the bay to the ocean migrates northward, cutting directly into the shore it passes. As this channel has migrated, it has repeatedly undercut the beach and dunes fronting North Cove, a process documented in a 1971 U.S. Army Corps of Engineers study and confirmed in more recent assessments (Talebi et al., 2017). The loss of Columbia River sediment reduced the material available to replenish the beach between these cycles, worsening the erosion the channel migration was already producing.

In efforts to stabilize the shore, local residents dumped old cars and planted trees, with little effect. By 2015, 640 of the original 766 parcels had been lost, and the community seemed to be faced with an insurmountable threat (Cowdrey, 2020). As stated above, over the last 100 years, the coast had receded inland an average of 100 feet every year (Talebi et al., 2017). North Cove residents searched for financial and technical support from the county, state and federal governments but were unsuccessful. A 2017 WA Department of Ecology assessment of coastal erosion and future projections predicted that most of the communities existing land would be gone by 2030, with sea level rise and intensifying storms from climate change further exacerbating the hazard (Talebi et al., 2017).

In 2016, a local resident, scientist and commissioner for Pacific County Drainage District No. 1 purchased \$400 of loose cobble and dumped it off the end of a road that had eroded into the ocean, inspired by erosion-mitigation projects in Oregon (Allan et al., 2023). Known formally as a dynamic revetment, the cobble dissipates wave energy. Not only did the erosion slow, but the land began to expand seaward for the first time in North Cove's history.

Drainage districts in Washington State are special purpose local governments, distinct from city or county government, originally established to manage drainage and protect land from flooding within a defined boundary. Washington drainage districts are granted their own governing commission and, under state law, carry authorities including eminent domain and the ability to levy assessments on property within their boundaries to fund their work (RCW 85.38). Pacific County Drainage District No. 1 predates North Cove's modern erosion crisis by decades, and its formal governmental standing, discussed further in the Results, gave its commissioners a legal and institutional platform for erosion response that an informal community group would not have had.

Following this success, the Willapa Erosion Control Action Now (WECAN) community forum was formed to coordinate further erosion-mitigation strategies between stakeholders in the surrounding area. In large part due to the success of this dynamic revetment, WECAN was able to secure over \$600,000 from state and county grants and local fundraisers and has since implemented nine adaptation projects ranging from further dynamic revetment constructions (Bayle et al., 2021) to the creation of an erosion mitigation master plan. Hoping to incorporate more community engagement into adaptation projects local to North Cove, another community member created Wash Away No More (WANM) in 2017. WANM is a community organization that has organized and advocated for smaller scale adaptation efforts such as planting dune grass

and installing trackers into the dynamic revetment cobble. They also host an active Facebook page with 1,800 followers to share information related to erosion and adaptation with the community.

Study Design

This study uses a qualitative case study design to examine community-based adaptation to coastal erosion in North Cove, Washington (Yin, 2018). A qualitative approach is well suited to this research question because it allows for close attention to the social processes that shape adaptation, dimensions that are difficult to capture through quantitative measures alone. A case study design specifically is appropriate here because it enables an in-depth investigation of these processes within their real-world context, particularly useful when, as in North Cove, the boundary between the phenomenon of interest and the context in which it occurs is not clearly evident (Yin, 2018). The data for this project are 32 semi-structured interviews, with abductive thematic coding conducted in ATLAS.ti (Saldaña, 2025). The study is guided by rural, coastal adaptation literature and adaptive capacity frameworks, with particular attention to dimensions of leadership, collective efficacy, and community engagement (Cinner et al., 2018; Adger, 2006).

Yin (2018) provides two relevant types of case study designs: an extreme case (one that deviates from theoretical norms or everyday occurrences), and a critical case, (one that is well situated to test theoretical propositions). The adaptive capacity frameworks explored in this thesis do not have clear, testable propositions linking local leadership, collective efficacy, and community engagement to adaptive outcomes, so the North Cove study represents an extreme case. Studying an atypical setting can surface social processes that a critical case would not reveal. North Cove faces some of the highest erosion rates on the U.S. western coast, and for

decades pursued adaptation with little to no support from higher levels of government while continuing to lose homes, roads, and land to the advancing shoreline, echoing the fate of the original townsite that was gradually swept into the ocean through the 20th century. Yet adaptive capacity is not limited to institutional resources (Cinner et al., 2018). It can also stem from the agency of local actors to experiment, self-organize, and collectively shape their futures. The success of erosion mitigation efforts since 2016 stands in contrast to the worldwide constraints on community-led adaptation projects (Selje, 2024) and challenges the traditional conceptualization of vulnerability. This case study provides an example of how adaptive capacity works in practice, making it a valuable context for advancing theories of adaptive capacity, collective efficacy, and community engagement in vulnerable rural settings.

Data Collection

The data for this study consisted of individual semi-structured interviews (n=32). Field observations and the field notes they produced were used to build familiarity with the community, inform recruitment, and refine the interview protocol. These observations are not cited as evidence in the Results chapter. Participants were adult residents in North Willapa Bay (a broader area than North Cove alone, since North Cove has no formal boundary of its own and residents, local organizations, and adaptation efforts in the surrounding area are closely connected to and affected by the same erosion dynamics) and local and state government practitioners who had direct experience with the area's erosion management. Recruitment for interviews followed purposive and snowball sampling techniques to capture a range of perspectives (Nyimbili & Nyimbili, 2024). Initial participants were introduced by a single trusted community leader over email and in person at a community event. This key informant had

relevant experience both as a resident of the community and as an adaptation practitioner. Additional recruitment occurred via flyer distribution, email, phone, and in-person conversations at community events, with follow-up referrals from participants.

This study was reviewed and approved by the University of Washington Institutional Review Board (IRB STUDY#00023468) prior to the start of data collection.

Interviews followed a semi-structured guide that was refined through advisor and community partner feedback. The guide included questions about experiences with shoreline change, perceptions of adaptation effectiveness, decision-making processes, and barriers or enablers to collective action. Data collection was an iterative process, allowing emerging insights to inform subsequent interviews through the addition, removal, and altered wording of questions. For example, the initial protocol focused on shared goals and values as facilitators for collective efficacy, but it became apparent after the first interview that other factors, such as local leaders, may be important facilitators as well. Interviews were conducted in North Willapa Bay and over the phone or Zoom from August to November of 2025, lasting one hour on average, and were audio-recorded with verbal consent. Demographic information (age, gender, and address) was also collected to contextualize the responses. Table 1 summarizes the composition of the sample.

Table 2: Sample Composition

Category	n
Total participants	32
Residents	26
Practitioners	6

In-person interviews	21
Phone and Zoom interviews	11
Age range	32-82
Gender distribution	12 Female, 20 Male

I also attended four local events to familiarize myself with the community and learn about current erosion projects. The first event, Woodfest, was a local community art and food festival (August 9, 2025 and August 10, 2025). The second event was a set of community office hours hosted by a local community organizer to solicit local concerns, ideas, and fundraise for erosion-control projects (September 3, 2025). The third event was a meeting hosted by the Washington Shoreline & Coastal Planners Group catered to local residents and erosion practitioners to discuss the process for designing, permitting, and coordinating dynamic revetments in the area (September 16, 2025). The final event was a community advisory team meeting hosted by the local conservation district to discuss plans for a future shoreline restoration project (November 18, 2025). I took on the “participant as observer” role to build trust with the community while also being honest and up-front about their objectives (Tracy, 2020). Field notes documented observations and reflections immediately following interviews and events. These field notes served to build contextual understanding, support recruitment, and refine the interview guide; they were not independently coded or cited as evidence in the Results chapter. Methodological, reflexive, and thematic memos were written throughout data collection to capture emerging themes, insights, and maintain researcher reliability.

Audio recordings were transcribed using Rev.com, a secure AI transcription service, with transcripts reviewed and corrected by the researcher for accuracy. Transcripts were

manually de-identified prior to analysis. All interviews were conducted in English.

Demographic and interview data were stored separately in a password-protected drive.

Data Analysis

The population of participants included local residents and erosion practitioners involved in coastal erosion mitigation efforts in North Cove, Washington. Coding occurred after transcription and de-identification of interviews and was completed iteratively over a period of eight months. All qualitative data were managed and coded in ATLAS.ti to support systematic organization across interviews. The first iteration of the codebook was developed prior to formal coding through read-throughs of the full set of interview transcripts. During these preliminary readings, I conducted open, exploratory coding using both concept (main idea) and process (action-oriented) codes (Saldaña, 2025) to identify recurring ideas, processes, and conditions related to facilitators and barriers to community engagement in coastal erosion projects, leadership dynamics, and efficacy. These preliminary codes were consolidated into a structured codebook. Minor refinements to codes and their definitions were made during analysis when ambiguities or redundancies emerged, reflecting the iterative and reflexive nature of qualitative coding.

Formal coding proceeded in two stages. In the first stage, transcripts were systematically coded using the established codebook, with codes applied to discrete meaning units such as phrases, sentences, and short passages. In the second stage, codes were reviewed based on frequency and conceptual overlap within ATLAS.ti to consolidate related codes into higher-order thematic categories. Analytic memos were written throughout to document coding decisions, emerging patterns, and interpretations, strengthening transparency and rigor. In the next stage of

analysis, I focused on identifying patterns within and between categories of facilitators and barriers to community engagement, leadership dynamics, and efficacy. Extreme cases were examined alongside more common accounts to clarify the range and boundaries of key themes, and attention was given to underrepresented topics in the data. Metacoding was used to consolidate first-cycle codes into broader conceptual categories of leadership, adaptive capacity, efficacy, and engagement.

Results

Findings are organized around six themes, each of which addresses the research question by describing the social processes that have supported or limited North Cove's adaptation to coastal erosion. Findings draw on interviews with all 32 participants, with individual themes supported by between 9 and 30 interviews.

In a rural community with limited formal institutional capacity, local leaders have served as important mechanisms to translate informal social relationships, modest financial resources, technical knowledge, and individual willingness into a coordinated response to erosion. At the same time, the values, risk perceptions, and social ties that residents bring independently shape the extent to which leaders' work translates into broad community participation. The interaction between what leaders do and what residents are willing to do given their own circumstances is the central social dynamic of North Cove's adaptation history, and it is what will determine the community's capacity to respond to future erosion as well.

Local Leaders as Boundary Spanners

Almost every participant (n=30) described how local leaders operate across the boundary between North Cove and the local, state, and federal government agencies involved in erosion mitigation, a role known as boundary spanning. Specifically, participants described leaders translating technical knowledge between residents and officials, using formal institutional channels to gain legal standing, building trust between residents and regulators, and, in the case of the Shoalwater Bay Tribe, drawing on a distinct government-to-government relationship with federal agencies. The following subsections address each of these dimensions in turn.

Several residents described leaders as having enough technical fluency to be taken seriously by engineers and agency staff, while also being able to translate that same information for neighbors with no background in erosion management. A resident attributed one leader's effectiveness specifically to this skill:

“[Leader] could talk to [practitioners] about dynamic revetment and observations on the beach and what might be something that might help out here and things like that. And he could talk to the loggers and the fishermen and cranberry farmers here. He just had that ability. He translated a lot of things into very simple terms.” (L15)

This account illustrates the two-way nature of the translation leaders performed, moving specialized language from practitioners down to residents and moving residents' practical knowledge up to a level engineers, planners and policymakers would engage with, converting each into a form the other side could use. Several participants also noted that leaders made deliberate choices about which words to use, avoiding politically charged terms like climate change or sea level rise with residents they judged unreceptive to them, and instead grounding

conversations in shared, concrete experience, such as storms residents had personally lived through.

Participants also connected leaders' institutional standing to a specific local governmental body, the drainage district, which several described as central to how leaders operated with legal authority. A practitioner explained the district's useful position:

“[Leaders] are part of a drainage district, and the drainage district is considered kind of a local agency, their own entity, with their own, role-making capabilities and things like that... [leader] and I had a meeting with some of my higher-ups where they had documents from the 1800s, like here's our establishment of our drainage district and what we have the capacity to do.” (P05)

This historical legal authority, rooted in the district's original mandate to manage drainage and prevent saltwater inundation, allowed leaders to operate outside conventional state permitting and gave them institutional standing in government conversations that an informal community group could not claim. Participants also credited leaders with the persistence needed to navigate this bureaucracy in the first place, describing the process as requiring someone willing to be, in one resident's words, *a very bullheaded person* (L05), and noted that this persistence allowed leaders to identify and build relationships with the county's Conservation District.

Beyond formal institutional channels, several participants described leaders doing relational work to build residents' trust in government and improve collaboration. A practitioner explained that some residents initially treated regulatory compliance as optional, reasoning that they would do whatever it took to save their property, and credited leaders with shifting that community mindset by working directly with residents to explain why compliance mattered for the group as a whole, since erosion-control projects on one property can create adverse

consequences for neighboring properties (P05). Leaders' bridging work builds residents' confidence that engaging with government processes is worthwhile.

A number of participants pointed to the Shoalwater Bay Tribe as a distinct and especially powerful boundary-spanning actor. They described the Tribe leveraging its distinct legal and political standing to benefit not only its members but the neighboring North Cove community as well. A practitioner described an instance in which the Tribe's advocacy reshaped what the Army Corps of Engineers considered feasible for the North Cove shoreline:

"The tribe has been really pushing the idea of a dynamic revetment to the Army Corps specifically. Back in 2018, the Shoalwater Tribe had a dune constructed out in front of a lot of their main area... And so, the Army Corps built, essentially, a giant dynamic revetment in 2021, 2022. That collaboration between them got the idea of this dynamic revetment into the brain of the Army Corps, which up until this point their solution was, if sand doesn't work, we're gonna hard armor everything." (P05)

The Tribe's advocacy introduced a new class of erosion-mitigation solution into the institutional vocabulary of an agency that had previously treated hard armoring as the preferable option, with consequences that extended to the wider North Cove shoreline.

Across these accounts, participants described a common concern that the relationships, credibility, and knowledge that make boundary spanning possible are not easily replicated and depend heavily on the specific individuals who built them. The community's capacity to continue accessing government resources, navigating permitting processes, and influencing agency decisions is therefore closely tied to whether current leaders can transfer these relationships and skills to successors. The drainage district offers one form of institutional

continuity, but the relational dimensions of boundary spanning discussed throughout this theme are considerably harder to institutionalize.

Flexibility and Experimentation Build Proof of Concept

About half of participants (n=14) described a culture of low-cost experimentation, some of it conducted outside formal permitting structures, that generated early evidence erosion could be meaningfully addressed. Participants connected this experimentation to the rural character of the community, described specific instances of informal trials generating proof of concept, and identified agency-side regulatory flexibility as a condition that made this experimentation possible. The following subsections address each in turn.

Rural Interdependence and Urgency as Roots of Experimentation. One practitioner pinned this experimental culture on the interdependent character of rural life, describing a rural “can-do attitude” rooted in residents relying on themselves and their neighbors, which they linked directly to the community’s willingness to experiment (P06). This description of a tightly connected community sits in some tension with the fragmentation and fraying of social ties described by other participants, discussed later in the discussion.

The same practitioner connected this culture of experimentation directly to the emergence of local leadership, describing both as responses to the same underlying condition:

“Erosion was happening to such a great magnitude. And such great material losses to the people in the community and potentially infrastructure, public stuff, that they had to say, we gotta do something, and we can’t just do this the way it normally is done. I think that is the kind of thing that both gives rise to experimentation, it’s the kind of thing that gives rise to that local leadership as well.” (P06)

This account suggests that participants saw experimentation and leadership as two responses generated by the same underlying urgency.

Informal Trials as Proof of Concept. Participants described specific instances in which trials conducted without prior government approval generated the evidence that later attracted formal support. One resident described the outcome of one such instance, in which a neighbor placed rock without a permit to protect their own property:

“All that was done illegally without the blessing of the county. But if it wouldn’t have been for that, because they protected all that out there just by rocking it. And the county never gave him permits or nothing to do that, but he just did it anyway to save his place. And now people are able to look at that and say, oh look, it works. Something works.”

(L16)

As this resident described it, the visible outcome of this unpermitted trial became the community’s first piece of evidence that erosion could be slowed at all. Several residents went on to describe smaller, self-funded trials conducted with agency awareness. One resident described one such trial:

“They thought about it for a while and realized, well, I’ve got \$400. Why don’t I do this experiment?... And we didn’t have any problems over the winter. It moved around some, but it was one thing... that was enough of a little proof of concept thing. So the next year, the conservation district found another, I think a hundred thousand.” (L15)

By this resident’s account, a four-hundred-dollar trial preceded a hundred-thousand-dollar institutional commitment the following year. The same resident suggested that North Cove’s small size and low profile made this kind of experimentation possible in the first place, since the

community had, in their words, gotten away with a lot because it was small and relatively unknown.

Agency Flexibility as an Enabling Condition. Beyond what residents themselves did, participants also described the regulatory posture of government agencies as a condition that either enabled or blocked this kind of experimentation. One practitioner contrasted the effects of flexible versus rigid agency postures directly:

“When the agencies have been more flexible, I’ve seen more collaboration ensue, I’ve seen more good vibes, I’ve seen more just, like, results that are, that do lead to something, whereas when agencies have kind of said, well, these are the rules and we’re sticking to it, that’s been a problem.” (P06)

This account suggests that community-level experimentation and agency-level flexibility functioned closely together.

Institutional Learning from Community-Led Trials. Participants also described these accumulated trials as having done conceptual work for government agencies. One practitioner described a specific uncertainty that early demonstrated outcomes helped resolve:

“Before any of these projects were constructed, no one really knew what category to put a dynamic revetment in. Is it a hard solution?... or is it nature-based, and how do these work. So I think being able to demonstrate that the beach is building back, that sediment and logs are accumulating, that grass is regrowing in areas where it wasn’t growing before... helped to kind of get buy-in on these ideas.” (P04)

Community-led trials helped resolve a classification question that had stalled institutional support, converting an informal experiment into an approach agencies were willing to recognize.

Values, Risk Perceptions, and Individualism Shape Engagement in Erosion Projects

Most participants (n=25) described factors, beyond leadership itself, that shaped whether and how they engaged with erosion projects. Specifically, participants pointed to values tied to self-reliance and place, individual risk perceptions shaped by competing concerns, and residents' orientation toward individual versus collective action. The following subsections address each in turn.

Self-Reliance and Place Attachment. Several residents described self-reliance as a defining value of the community, one that could either motivate or discourage engagement depending on how it was directed. A resident described this value as central to their own and their neighbors' sense of identity, framing initiative as an expression of independence rather than a response to any specific threat (L11). Applied to individual risk tolerance, however, that same self-reliance could work against engagement. One resident described taking pride in being tough enough to handle whatever came their way, whether from nature or from economic hardship, and explained that this toughness shaped how much they saw erosion as a problem worth acting on before it became unavoidable (P06). Self-reliance was both a motivator of collective initiative and a rationale for individual deferral, depending on whether it was expressed toward the community's problem or toward one's own capacity to cope with it.

A related driver was place attachment, expressed most strongly among multi-generational residents. One resident described this connection in generational terms:

"I've lived here all my life, my parents and a lot of family history here... These are my people, this is my country, this is my ground. Yeah. If there's problems, I'm going to stick up and we're going to fight it out... there's no surrender, there's no backing up. We're here for the long run." (L23)

For residents with this depth of connection, engagement appeared to be driven by a sense of identity and commitment to maintaining their livelihoods in this place.

Risk Perception and Competing Priorities. Beyond values, participants described engagement as shaped by where erosion ranked relative to the other risks and demands competing for their attention. Several residents described tsunami risk as a more immediate and salient concern than erosion, and past failed projects appeared to have bred a cautious, wait-and-see orientation among some residents, who described having watched enough initiatives stall or collapse that they were reluctant to invest belief in new ones (L23).

Individual Versus Collective Orientation. A third pattern participants described was about whether residents approached erosion as an individual problem to solve on their own property or a collective one requiring coordinated action. Some residents' focus on protecting their own property specifically, rather than participating in broader community efforts, was described by one practitioner as a risk to the collective effort as a whole:

“The concern is that individual approaches that prioritize individual properties, rather than the collective good, and need for the community and ecosystem will hold out, and cause it not to work, or just that people will be in it for themselves, rather than in it for something bigger, and not be able to understand the necessary trade-offs.” (P06)

This account frames individual versus collective orientation as a coordination problem. Residents pursuing their own protection independently can undercut the shared infrastructure and trust that larger-scale projects depend on. Shared exposure to the erosion threat appeared to counteract this pull toward individual action. A resident observed that when homes and livelihoods are on the line for everyone at once, having a neighbor facing the identical problem tends to bring people together rather than apart (L04).

Leadership Builds Collective Efficacy

Many participants (n=23) described how leaders worked to build residents' shared belief that the community could work together to address erosion. Specifically, they described leaders showing residents that their voices and efforts mattered, keeping the community informed and making progress visible, and creating accessible, low-barrier ways for residents to contribute. The following subsections address each in turn.

Showing Residents Their Participation Mattered. Several residents described leaders demonstrating that individual voices and efforts could produce real change. One resident described this shift directly:

“What has happened in the past, because people, they’re afraid to speak up or didn’t think their voice mattered. Well, the work they’ve done down there and the tests and all that, your voices do matter. It’s changed.” (L05)

A second resident described a related shift in what the community believed was possible, describing a sense that people had begun to accept that something positive could come from the work already underway (L023). Leaders also modeled the behavior they hoped to see spread, with one resident describing a specific leader as a direct source of personal inspiration to stay and stay involved in the community (L08).

Keeping the Community Informed and Making Progress Visible. Participants also described leaders keeping residents regularly informed about the state of erosion projects, both to build awareness and to make incremental progress visible over time. One resident described the consistency of this outreach:

“We have a lot of sensing sessions. [Leaders] held a lot of public updates and that kind of stuff, and sensing stations, and there’s pretty good showing each time we did it, probably 50, 60 people would come, which is pretty good for this area.” (L12)

Beyond communication, the specific erosion-mitigation strategy leaders promoted appeared to make progress feel visible and attainable in its own right. One resident explained why this mattered in a community wary of public spending:

“The dynamic revetment as a 1. effective and 2. cheap solution has really gone over well. In this conservative population the idea of not spending a bunch of tax money is really more important than expecting them to spend tax money on our tiny community. The fact you can do it for cheap. The do-it-yourself aspect of that is a really important selling point for why a lot of the community has accepted it as a solution.” (L15)

By promoting a strategy residents could realistically picture themselves carrying out, leaders made the abstract task of erosion mitigation feel concrete and achievable.

Creating Accessible Ways to Contribute. A third pattern participants described was the deliberate creation of small, low-barrier ways for residents to get involved, rather than requiring large commitments of time or resources. One practitioner described how this was built into the community’s engagement strategy, explaining that residents were given concrete, individually manageable tasks, like planting a patch of dune grass or buying merchandise to support fundraising sales, that let them feel their hands could make a difference even against an overwhelming problem (P04).

Responsibility for Erosion Projects Falls Disproportionately on Local Leaders

The majority of participants (n=23) described erosion response in North Cove as a joint effort between the community and government, one that neither could sustain alone. Within this shared arrangement, participants also described the practical burden of initiating and sustaining projects falling primarily on a small number of local leaders. The following subsections address how participants described this mutual dependency, the limits of what community resources alone can provide, and the risks of concentrating so much responsibility in so few people.

Mutual Dependency Between Community and Government. Several participants described government financial support and community-driven initiative as mutually dependent, with neither able to substitute for the other. One resident explained this reciprocity directly:

“I don’t think the community could gather the resources to do what’s been being done without government financial input. And there’s been a lot of the planning of it that has been very much assisted by the government’s resources to do it. But there’s also, the government wouldn’t have gotten into it if there hadn’t been small scale local trials.” (L22)

A practitioner described a related form of community contribution, crediting locally driven advocacy with convening otherwise disconnected institutional actors, including the Shoalwater Bay Tribe and the Department of Transportation, around a shared effort (P04).

The Limits of Community Resources at Scale. While participants credited community initiative with helping draw government partners in, several also described the community’s own resources as insufficient to match the scale of the erosion problem on their own. One resident illustrated this gap:

“If you get 20 or 30 people at an event, you’re doing awesome. And so [leader], I think she had eight people at the last event, which is great. But that puts in perspective, that’s how much funds they would be able to generate. You know what I mean? It shows you how essential other agencies are going to be involved.” (L14)

A practitioner described a related consequence of these limited resources, noting that funding often only became available reactively, once an individual resident’s home was already directly at risk (P05).

Concentrated Responsibility and Succession Risk. Several participants described the ongoing burden of erosion response as resting on a small group of individuals whose personal knowledge, relationships, and persistence have driven most of the progress to date. A practitioner described the full scope of what these leaders are expected to sustain:

“Local leadership and local champions are so critical to not just getting projects off the ground, but actually, like, managing them and implementing them, adaptively managing them for their lifetime, because it’s not just, like, a set in place and forget, with anything in the face of climate change, but especially with nature-based solutions, and in a place as dynamic, and as difficult to working as North Cove.”
(P03)

This account frames leadership an ongoing, open-ended commitment. Other participants raised concerns about whether that commitment is sustainable over time. One practitioner reflected:

“My concern, I guess, would be that we do great for a few years, but we don’t have a sustainable community foundation or leadership to sustain the maintenance, adaptive management, ongoing work that is required of this, because it is a nature-based strategy. That means you don’t just put it in and leave. I’ve been part of other projects

where the key players walk away from it, who had a really strong vision. That was what drove the success of it... But in general it normally doesn't stay at the same speed.” (P06)

A resident raised a related concern from a longer historical vantage, describing a recurring pattern in which the generation that solved a problem eventually passes on, taking hard-won knowledge with them and leaving the next generation to rediscover solutions that already existed (L22). Some participants pointed to steps already being taken to address this risk; one resident described leaders bringing in outside engineers and firms specifically to build a broader base of technical expertise beyond what the founding leaders alone could provide (L15).

Co-Benefits of Community Engagement in Erosion Projects

About a third of participants (n=9) described benefits of participating in erosion-control efforts that extended beyond the projects' physical goals. Participants described reduced anxiety, a reinforced sense that collective action could make a difference, and stronger social bonds across a population that might otherwise remain fragmented. The following subsections address the psychological and social dimensions of these co-benefits in turn.

Psychological Co-Benefits. The most immediate psychological co-benefit participants described was a reduction in the chronic anxiety of living on a rapidly eroding shore. One resident connected this relief directly to visible physical progress:

“I think when [leader] started putting in the rocks and we started seeing improvements and it not moving so much that I think people started relaxing and thinking, we'll survive. At least in my generation, I don't know if it'll be there for my kids, but at least my generation will be able to survive there.” (L05)

A second resident described a similar shift in more visceral terms, recalling that they used to lie awake at night listening to the surf and feeling afraid, a fear that had since eased (L24). For these residents, the clearest change erosion projects brought was a renewed sense of safety.

Participants also described a sense of hope tied to visible action being taken. I read this finding as reinforcing the collective efficacy findings presented in Theme 3, since it describes the same underlying belief, that collective action can make a difference, expressed here through participants' own words about hope. One resident described this directly:

“We were talking about any action is awesome, way better than nothing. And I think that that is a little grasp of hope for people, that there is some preventative action being taken.” (L10)

This account suggests that even interventions falling short of a complete solution shaped residents' belief that their situation was not entirely outside their influence, echoing the same belief in collective capacity that Theme 3 describes leaders actively building.

Social Co-Benefits. For some residents, involvement in erosion work also became a meaningful avenue for building individual relationships within the community. One resident described this personally, explaining that the erosion crisis gave them and their spouse an opportunity to contribute their professional skills and be accepted as community members (L03). For this resident, the erosion response opened a door into community life that might not otherwise have existed.

Participants also described engagement in erosion projects as a source of broader social cohesion across a community otherwise divided along demographic, economic, and residential lines, discussed in Theme 2. This point overlaps in part with the earlier finding that shared exposure to a common threat can counteract individualism. Here, the

emphasis is on engagement itself as a downstream source of social cohesion. One resident described erosion response as one of the few things capable of bridging these divides:

“We have different interests and different problems to deal with... They’ve got their problems and we’ve got our problems. This is the only thing that really kind of ties us together a little bit.” (L23)

By this resident’s account, the erosion response was unique because it was one of the only shared concerns capable of connecting groups with otherwise little in common.

Discussion

This study examined the social processes that have supported and limited North Cove's adaptation to coastal erosion, and how those processes affect the community's ongoing adaptive capacity. Drawing on 32 interviews with local residents and adaptation practitioners, the findings reveal that in a rural community with limited formal institutional capacity, adaptive capacity is concentrated in and activated through the boundary-spanning work of a small number of local leaders and the community’s perceived collective efficacy. Below, I contextualize these findings in relation to the literature on adaptive capacity, boundary spanning, collective efficacy, locally led adaptation, and community-based adaptation.

Local Leadership as a Cross-Domain Enabling Mechanism

Cinner et al. (2018) organize adaptive capacity into five domains: assets, flexibility, social organization, learning, and agency. This framework is useful for describing what adaptive capacity consists of, but it says less about the mechanism through which those domains are

activated, especially in low-resource settings where formal institutions are weak. North Cove's case suggests that local leadership, specifically the boundary-spanning work of a few key individuals, is one key mechanism.

This case extends the adaptive capacity literature by identifying boundary spanning as a social process that helps activate several of Cinner et al.'s (2018) domains. The concept of boundary spanning describes actors who operate at the interface between distinct social systems and translate knowledge, broker relationships, and manage information flows between communities and institutions (Tushman, 1977; Bednarek et al., 2018). North Cove's leaders fit this description well. They translated technical information about dynamic revetment and coastal processes into language accessible to community members. They navigated complex permitting processes that residents didn't have the capacity to. They cultivated relationships with local, state, and federal government agencies, converting a disengaged regulatory system into active partnerships. And they leveraged the legal standing of the drainage district, a structure Bednarek et al. (2018) might recognize as a boundary organization, to give their informal community work formal institutional standing in government conversations.

This case demonstrates how boundary spanning enables several adaptive capacity domains in Cinner et al. (2018), though not all with equal directness. The fit is strongest in the assets, learning, and social organization domains, each of which directly involves crossing the boundary between community and institution that boundary spanning describes. In the assets domain, boundary spanning connected the community to external financial and technical resources it could not have generated internally. In the learning domain, it transferred scientific knowledge from practitioners and agencies to residents in accessible form. In the social organization domain, it built the coalitions between sub-communities, the Tribe, and multiple

government agencies. The connection to flexibility and agency is present but more indirect. In the flexibility domain, boundary spanning brokered the regulatory tolerance that allowed informal experimentation to proceed, but the experimentation itself, discussed further below, was often driven directly by residents rather than by leaders acting as boundary spanners specifically. In the agency domain, leaders demonstrated to residents that their voices and contributions could influence outcomes, but this work was more internal, relational engagement with residents than the cross-system bridging that defines boundary spanning in the strict sense.

This distinction also speaks to the locally led adaptation literature, which distinguishes locally led efforts, where communities hold decision-making authority, from community-based adaptation more broadly, where communities may be consulted but authority remains external (Rahman et al., 2023). Through the drainage district's legal standing, North Cove's leaders held direct decision-making authority over erosion response for years before formal agency involvement, positioning this case closer to the locally led adaptation ideal than to conventional CBA.

These findings have implications for how rural adaptation programs are designed. The rural adaptation literature documents the structural constraints facing communities like North Cove including limited governance capacity, aging populations, and resource-dependent economies (Jurjonas & Seekamp, 2018; Magnan et al., 2023) but says less about how communities work around them. North Cove's case suggests that boundary-spanning leaders are a primary workaround. Funders and agencies should treat relationship-building time, such as staff availability for informal check-ins, co-attendance at community events, and continuity of the same point-of-contact over multiple years, as a resourced program component, rather than an incidental byproduct of technical project delivery. Programs that focus too heavily on technical

project outcomes, such as construction milestones or permit approvals, without also investing in the relationships that connect local leaders to institutional partners, may struggle to sustain the bridging function this case suggests is necessary for success.

Collective Efficacy as a Dynamic Linkage Between Leadership and Adaptive Capacity

The findings show that leaders have built collective efficacy, the community's shared belief in its ability to combat erosion, through education and accessible opportunities for involvement. This extends the existing literature on efficacy and adaptation, which has repeatedly established links between self-efficacy, collective efficacy, and adaptive behavior (Bandura, 1997b; Thaker et al., 2016; Mzimela & Moyo, 2023), by documenting the specific pathways through which leaders cultivate collective efficacy in a rural coastal community and by highlighting the dynamic character of efficacy. Mzimela and Moyo's (2023) systematic review found only eight studies worldwide that met inclusion criteria for examining the relationship between collective efficacy and climate adaptation, and concluded that the existing evidence base is narrow and geographically sparse. Few of those studies trace the specific mechanisms through which efficacy is built or examine how it changes over time, which is the gap this study addresses.

Collective efficacy in North Cove rose as leaders generated visible results and created low-barrier ways to participate. However, it also declined as project success reduced the visibility of the threat and as external institutions became more involved. Residents described complacency replacing urgency as erosion receded from their daily awareness, and some described a perceived transfer of responsibility from the community to government as institutional engagement grew. This pattern echoes Ayal et al.'s (2021) finding that repeated

exposure to drought eroded rural Ethiopian farmers' confidence in their collective ability to cope over time, though the mechanism in North Cove appears to run in the opposite direction. Rather than repeated hardship eroding efficacy directly, as in Ayal et al. (2021), it is the reduction of hardship following successful mitigation that appears to erode the urgency sustaining collective efficacy. Together, these cases suggest that collective efficacy in adaptation contexts may be vulnerable at both extremes, when a threat feels insurmountable and when it feels resolved. This fluctuation is similar to Bandura's (1997b) account of mastery experience as a primary source of efficacy. Visible progress builds shared confidence, but when the conditions that originally demanded collective action improve, the motivational basis for continued engagement weakens. North Cove's case illustrates this cycle with unusual clarity because the community has experienced a clear transition from severe, unrelenting erosion to years of success, making the dynamic nature of efficacy visible in ways it might not be in communities still in early stages of response.

Efficacy functions most directly within the agency domain. Cinner describes agency as the degree to which individuals and communities can exercise meaningful choice in adaptive responses, but having agency does not guarantee that capacity will be exercised. Collective efficacy appears to be the condition that determines whether agency gets used. Residents need to believe that acting together will make a difference before they choose to act at all. When collective efficacy is high, residents mobilize assets, experiment with new strategies, share knowledge, and build social networks. Where it is low, those same capacities can sit unused.

Collective efficacy also helps make sense of a related set of findings on residents' values and risk perceptions. Self-reliance, a value several residents described as central to the community's identity, appeared to cut in two directions. It motivated the grassroots initiative that

leaders built on, but applied to individual risk tolerance, it also gave some residents a reason to defer engagement, reasoning that they could handle erosion on their own terms if and when it became unavoidable. Self-reliance is a feature of collective efficacy. Residents' belief in their own individual capacity to cope, a form of self-efficacy in Bandura's (1997a) original sense, appears to have sometimes substituted for their belief in the community's collective capacity to act together. Individual risk perception operated similarly. Where erosion ranked low against more immediate concerns, such as tsunami risk or the price of cranberries, residents had less occasion to weigh their own efficacy beliefs against the threat at all. And where residents oriented toward individual rather than collective solutions, protecting their own property independently rather than participating in shared projects, this too can be understood as a case in which individual efficacy operated without a corresponding collective efficacy to channel it toward joint action.

The collective efficacy literature on coastal adaptation is thin, and most studies strictly employ quantitative methods (Mzimela & Moyo, 2023; Thaker et al., 2016). North Cove represents one of the first cases to examine collective efficacy in a rural North American coastal context, and the nuances of collective efficacy that are found (notably the paradox that success can itself erode the motivational conditions that produced it) are not well represented in existing research.

As erosion-mitigation is a long-term endeavor, sustaining collective efficacy will require the continued creation of visible results and accessible participation opportunities through the easy and hard times.

Co-Benefits of Community Engagement as Investments in Future Adaptive Capacity

The findings show that participation in erosion projects has produced psychological and social benefits beyond their hazard-mitigation purpose, including reduced anxiety, renewed hope, and strengthened social bonds across an otherwise fragmented community. These findings are consistent with the growing recognition in the community-based adaptation literature that CBA projects produce co-benefits alongside their primary hazard-reduction goals (Gero et al., 2011; Kirkby et al., 2018). The North Cove case adds a more explicit account of how co-benefits feedback into adaptive capacity, and are themselves, investments into the conditions that make future adaptation possible. The specific co-benefits documented here, reduced anxiety and stronger social ties across a fragmented community, map directly onto the psychological and social conditions this study identifies elsewhere as necessary for sustained engagement. Residents need both the emotional capacity to stay involved and the cross-community relationships through which future collective action would be organized.

Reduced anxiety and renewed hope matter for adaptive capacity because communities under sustained emotional strain are less likely to sustain the long-term engagement that erosion adaptation requires. This aligns with proactive coping theory, which holds that self-regulatory resources are finite and are depleted by chronic stress, leaving less capacity available for the forward-looking, effortful behavior proactive adaptation requires (Aspinwall & Taylor, 1997). The residents whose fear and anxiety have decreased in recent years have a restored psychological capacity to engage with future erosion management.

The social cohesion produced by shared participation in erosion projects matters in a similar way. North Cove's sub-communities - cranberry farmers, retirees, part-time residents, and others, have limited common ground beyond their physical proximity. Residents described

erosion response as one of the only issues capable of bringing these groups into contact, and the relationships formed through shared project work strengthen the social organization domain that Cinner et al. identify as a core component of adaptive capacity. Co-benefits connect directly to the adaptive capacity framework because projects that reduce anxiety and build social ties are simultaneously building a relational infrastructure through which future adaptive actions can be organized. As far as I can tell, the CBA literature has not previously articulated this feedback loop explicitly, and the North Cove case suggests it deserves more systematic attention in how community-based adaptation programs are designed and evaluated.

The Importance of Informal Experimentation: Extending the Flexibility Domain

Flexibility emerged as a critical dimension of North Cove's adaptive success, and the findings both support and extend Cinner et al.'s (2018) treatment of flexibility as a domain of adaptive capacity. Where Cinner et al. describe flexibility as a community's willingness to change strategies in response to new information, the North Cove case shows that flexibility depends as much on the community as it does the regulating agencies. This aligns with Folke et al.'s (2005) account of adaptive governance, which identifies experimentation and learning as foundational to community-level adaptation and argues that enabling institutional structures are as important as community willingness to act. It also echoes Gupta et al.'s (2010) Adaptive Capacity Wheel, which similarly treats room for autonomous change and institutional variety as necessary institutional-level conditions for flexibility, rather than flexibility being solely a community-level disposition. In North Cove, the informal, low-cost experiments that generated proof of concept for dynamic revetments were motivated by regulatory leniency, community obscurity, and a rural culture of self-reliant problem-solving. This finding contrasts research on

nature-based coastal adaptation in more heavily regulated settings, where permitting requirements and conflicts between shoreline restoration and habitat conservation goals were significant institutional barriers to implementation (Gittman et al., 2024; NCCOS, 2023). Studies characterizing social barriers to nature-based coastal adaptation have found that institutional and governance barriers consistently rank among the most significant constraints to implementation (NCCOS, 2023), a pattern North Cove's early experimentation largely avoided because it occurred before regulatory attention had extended to this stretch of coastline. When that space was available, small trials produced the observable evidence that shifted agency opinions and brought in larger investments. When regulations narrowed that space, grassroots progress slowed (although top-down projects increased, simultaneously). Flexibility as an adaptive capacity dimension needs to be reconceptualized to exist both within communities and between communities and the institutional environments in which they operate. For rural coastal communities in particular, the ability to experiment outside the margins of external regulators can be a foundational mechanism for learning, a process that policy frameworks should seek to protect rather than eliminate.

Limitations

This study has several limitations worth noting. First, the single-case design limits the generalizability of findings. North Cove is an extreme case, a community that has achieved significant progress despite severe resource constraints due to its unique context. These features may not be present in other rural coastal communities, and caution is warranted in applying findings from this case to different contexts. The findings are theoretically generative and speak

to the mechanisms of adaptation in low-capacity rural settings, but are not intended to be statistically representative.

Second, the cross-sectional design captures a moment in time after significant adaptation progress had already been made. The study cannot account for how social processes changed over the course of North Cove's adaptive history, which limits what can be said about causality and trajectory. Retrospective accounts of how the community organized itself in earlier periods are filtered through participants' current understanding of what worked, which could overstate the coherence of past processes.

Third, residents who agreed to be interviewed may be more engaged with erosion issues than those who did not, which could produce an account of community engagement that is more active and organized than the full picture. Less engaged residents' perspectives are underrepresented in the findings.

Fourth, my positionality shaped this research. I am a white, heterosexual man conducting this study through a university whose research relationships with rural, tribal, and otherwise marginalized communities are burdened by histories of exploitation, and I entered North Cove as an outsider with no prior relationships in the community. Trust had to be built from the ground up through an initial introduction from a trusted community leader, repeated attendance at local events, and transparency about my role and intentions before residents were willing to share their honest experiences. These dynamics likely shaped who was willing to speak with me, what they chose to share, and how I interpreted what I heard.

Future Research Directions

Several directions for future research follow from these findings. The relationship between self-reliance as a cultural value and community engagement deserves systematic attention. North Cove's findings suggest that self-reliance is a particularly important variable in rural adaptation contexts, as it was both a driver of grassroots initiative and a rationale for coping. A comparative study across rural communities with different cultural orientations toward independence and community could clarify the exact conditions where self-reliance motivates collective action rather than suppressing it, and what role leaders play in channeling community values.

The boundary-spanning role of local leaders also needs further investigation in other rural coastal and rural adaptation contexts. North Cove's case demonstrates that boundary spanning is a viable mechanism for connecting low-resource communities to institutional resources and vice versa, but it also shows how fragile this mechanism is when concentrated in a few individuals. Longitudinal research following communities through leadership transitions would help specify whether and how boundary-spanning capacities can be transferred, and what kinds of succession planning are most effective.

Finally, the dynamics of collective efficacy in North American coastal adaptation deserve dedicated research attention. The complacency paradox documented here, in which adaptive success reduces the urgency that motivated participation, may be more widespread than current literature acknowledges, and it has important implications for how adaptation programs sustain community engagement over time. Longitudinal studies tracking collective efficacy in communities that have experienced periods of visible adaptation progress would help determine

whether the pattern observed in North Cove is generalizable and what interventions can interrupt it.

Practical Implications

The findings from this study carry practical implications for policymakers, adaptation practitioners, and the North Cove community itself. For government agencies working on rural coastal adaptation, the case demonstrates that regulatory flexibility can create opportunities for adaptive learning in low-resource communities. Regulatory flexibility refers to agencies' willingness to tolerate small-scale, low-risk trials ahead of full permitting review, and to treat observed outcomes from those trials as legitimate evidence in later permitting or funding decisions, rather than requiring proof of concept before any activity is allowed to occur at all. The informal, low-cost experiments that generated the proof of concept for dynamic revetment in North Cove would not have been possible under a stricter enforcement environment, and the agencies that eventually became the community's most important partners did so in part because they were willing to treat early grassroots results as evidence. Creating formal pathways for low-stakes experimental trials could include provisional or conditional permits scoped to small pilot installations, monitoring-based accountability in place of upfront design approval, and clearly defined thresholds at which a successful pilot can be scaled up through the standard permitting process. Structures like these, with monitoring as the agencies' primary responsibility during the pilot phase, could unlock learning opportunities that current regulatory structures, which typically require evidence before granting any approval to generate that evidence, tend to prevent.

For adaptation practitioners and funders, the findings highlight the risk of investing in projects without investing equally in the boundary-spanning leadership that connects those projects to the community and sustains them over time. North Cove's adaptive capacity was built through relationships, trust, and technical credibility accumulated over years of persistent work by a small number of individuals. Programs that neglect the key responsibilities of community leaders beyond just the planning phase may struggle when those individuals step away. For the North Cove community, the findings affirm that the community's willingness to experiment, advocate, and organize in the face of an immense threat and structural disadvantages has produced results that other communities and agencies are now learning from. These findings will be shared back to the community in a brief report and local presentation.

Chapter 4: Conclusion

This thesis set out to understand what social processes support or limit North Cove's adaptation to coastal erosion. Chapter 2 reviewed five bodies of literature to argue that local leadership and collective efficacy, while central to adaptive capacity, remain poorly understood in rural, U.S. coastal contexts specifically. Chapter 3 filled that gap through a qualitative case study of North Cove, Washington, a rural community that has sustained a locally led response to some of the highest erosion rates on the U.S. Pacific coast despite minimal formal institutional support.

The findings show that North Cove's adaptive capacity has depended on the interaction between what a small number of local leaders have done and what residents have been willing to do given their own values, risk perceptions, and circumstances. Leaders functioned as boundary spanners, translating knowledge, brokering resources, and building coalitions across the

boundary between the community and the local, state, and federal institutions it depended on. They built collective efficacy through education, visible results, and accessible opportunities for residents to contribute, though that efficacy proved dynamic rather than fixed, rising with visible success and eroding as urgency faded. Residents' own self-reliance, place attachment, and competing priorities shaped whether and how they engaged, sometimes reinforcing leaders' efforts and sometimes working against them. Informal experimentation, often conducted with limited resources and occasionally without prior government approval, generated the proof of concept that eventually drew in formal institutional support. And participation in this work produced psychological and social benefits that extended beyond erosion mitigation, reinforcing the collective efficacy and social organization that future adaptation will depend on.

These findings extend existing adaptive capacity scholarship in several ways. They identify boundary spanning as a mechanism through which the assets, learning, and social organization domains of adaptive capacity are activated in a low-resource setting, though the mechanism's reach into flexibility and agency proved more indirect. They document the specific pathways through which collective efficacy is built and show that it can decline precisely when a community's efforts succeed, a pattern with implications for how adaptation programs sustain engagement over time. They show that flexibility, as an adaptive capacity domain, depends on the regulatory environment as much as on community disposition, and that regulatory space for informal experimentation is important. And they suggest that the co-benefits of community engagement are ongoing investments in the conditions that make future adaptation possible.

These findings also come with limitations. North Cove is an extreme case, and the specific institutional structures and individuals that made its adaptation possible may not exist elsewhere. The study captures a moment after significant progress had already been made and

cannot fully account for how these processes changed over time. These limits do not diminish what the case shows about how adaptive capacity can be built in a low-resource rural community. They point to future research on how leadership and collective efficacy function together in other rural coastal contexts, and on what happens to a community's adaptive capacity when the leaders who built it are no longer able to continue.

North Cove's story is not finished. The erosion that shaped this research will continue to be a threat, the leaders who have carried this work for years will not always be able to, and the collective efficacy this thesis has traced will continue to rise and fall with the visibility of the threat itself. What this research offers is a grounded description of the social processes that have gotten it this far, and a case for why understanding those processes matters for rural coastal communities beyond North Cove.

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Appendix

Interview Protocol

Opening

1. Which community do you live in?
2. Tell me a little bit about your connection to [community]?
 - a. How long have you lived or spent time in the area?
 - b. *(Opt) What first brought you here?*
 - c. *(Opt) What do you do for work?*
3. What do you love about [community]?
 - a. *(Opt) What keeps you here?*

Current Concerns and Impacts of Erosion

4. First, I'm curious, what changes to the coast have YOU observed over the years?
 - a. How would you say erosion has affected you personally?
 - b. Has it affected how you feel about living here or your sense of safety?
 - c. *(Opt) Can you tell me more about that?*
5. When thinking about erosion and coastal change, what are some of the biggest concerns you have?
 - a. Are there other issues or challenges in the community that are on your mind these days, aside from erosion?
 - b. *(Opt) Can you tell me more about that?*

Individual Agency

6. What sorts of things have you done personally to deal with erosion?
 - a. Can you walk me through some of the things you've done? It could be sharing information about a Wash Away No More event, raising awareness about the erosion issues, taking care of the beach, protecting your own home.
 - i. *(Opt) When did you do that / when did that happen?*
 - ii. *(Opt) Have you had to make any changes to your home or routines because of erosion?*
7. How aware are you of the local projects that are in place to deal with erosion?
 - a. What have you heard about?
 - i. *(Opt) Have you heard about the new \$13 million grant from NOAA to expand the North Cove dynamic revetment?*
 - b. Do you think these activities/actions are working? Why or why not?
 - c. Are there any changes you would like to see to how the erosion is currently managed?
8. Thinking about your role in the community, do you think that YOU can make a difference in [community's] adaptation efforts?
If yes,
 - a. Tell me more about that....
 - b. *(Opt) Can you tell me about any experiences where you think your actions led to change?*
If no,

- a. Tell me more about that...
- 9. What might be stopping you from getting more involved in efforts to deal with erosion?
 - a. Is there anything that might make it easier for you to get more involved?
 - b. *(Opt) Are there kinds of support or resources that would help?*
 - c. *(Opt) For example if you could have clearer information on projects and their impacts, or funding for more projects, or stronger relationships with community members?*
 - d. *(Opt) What would need to change for you to get more involved?*

Community Action and Collective Efficacy

- 10. How do you feel about your community's ability to tackle problems together? This could be related to erosion or not.
If positive,
 - a. *(Opt) Can you give me an example?**If negative,*
 - a. What do you think gets in the way?
- 11. *(If the above example they shared was not about erosion)* When you think about EROSION specifically, how confident are you that you and your community can tackle it together?
- 12. What do you think helps your community work together on erosion issues?
 - a. *(Opt) Can you give an example of a time when people did or didn't work together?*

Power, Influence, and Voice

- 13. First, what kinds of conversations are happening in your community about where erosion is headed in [community]?
 - a. What has changed about these conversations over the years?
- 14. Do you know much about who the key players are when it comes to making decisions about erosion? *Write down the individuals, organizations/stakeholders that they mention.*
- 15. What does the decision-making process typically look like?
 - a. Among these different stakeholders that you mentioned (*list them*), who do you think has the most influence over what gets decided?
 - i. Can you remember a time when this shifted noticeably?
- 16. I've heard some people say that [community] residents have a lot of influence in decisions around coastal issues, while others have said they have very little influence. Where do you stand?
 - a. What voices do you think are missing from the conversation?
- 17. Can you think of a time when a decision was made about coastal issues or erosion that residents disagreed with?
 - a. *(Opt) How did that play out?*

Looking Ahead

- 18. If you had a magic wand and you could wave it to change anything about [community], what would it be?

Closing

19. Is there anything else you'd like to share that we didn't get to talk about?
20. Would you be open to me following up with further questions if needed or sharing a summary of this research later on?
21. Can you recommend anyone else you think I should talk to?

Codebook

Category	Code	Definition	Exemplar Quote
Collective efficacy influences		Psychological, social and structural influences on community members' confidence in their collective ability to adapt to coastal hazards	
	leaders educating the community	Leaders sharing knowledge or raising awareness with residents about erosion and mitigation strategies	<i>We have a lot of sensing sessions. [Leaders] held a lot of public updates and that kind of stuff, and sensing stations, and there's pretty good showing each time we did it, probably 50, 60 people would come, which is pretty good for this area.</i>
	leaders empowering the community	Leaders improving the community's confidence and/or capacity to act on erosion	<i>[Leader] was my inspiration when I got here... telling me what he did, and he volunteered to do all this stuff and he's full time at it, that just impressed me.</i>
	leaders recruiting community	Leaders bringing others into active participation in erosion projects	<i>[Leader]'s hired me to do some sign work for him... I've helped him with the rock tracking. Mainly just go hunt</i>

			<i>them down, find them and dig them up.</i>
	leaders charisma and empathy	Personal qualities of leaders that attract community support and involvement	<i>[Leader] was a powerful player back in Washington DC. You would never guess it because she was just a slight old gal. Really nice, sweet. And she'd go back and rub shoulders with the politicians back in DC and low and behold, here come millions of dollars.</i>
	community brainstorming	Community members generating ideas for erosion solutions together with leaders	<i>We didn't have a way to gauge if the rock was staying and moving. And that's when I said, well, wouldn't it be nice if we could take a picture anytime of day, and anybody could get the data from it?</i>
	community donating	Financial or material contributions from community members to erosion projects	<i>I've probably donated art to trying to raise money for the grassroots effort over here trying to put in stuff and I mean they have fundraisers and stuff like that.</i>
	confidence in mitigation work	Trust that current mitigation strategies are effective, building collective belief in the approach	<i>We've seen some really good storms come in there the past couple of years... 13 foot, 14 foot seas and 60 mile an hour winds... and it has kept it from just coming in and tearing land up.</i>
	squeaky wheel	The role of persistent, vocal advocacy in	<i>I believe that everybody's voice matters, it's just you have to get a lot of</i>

		institutional settings; a key bridging behavior	<i>them. The more you can get the louder you are. The squeaking wheel always gets grease.</i>
	futility	Belief that mitigation efforts will not meaningfully change outcomes; inhibitor of collective efficacy	<i>There's really nothing we can do to prevent it. So you just live with it day by day.</i>
	fading erosion salience	Declining attention to erosion over time as projects succeed, reducing community motivation to stay engaged and compounding overreliance on leaders	<i>Yeah, if it's not giving you any grief it kind of falls in the distance, you don't really pay attention to it.</i>
	power of nature	Recognition of nature as a dominating, awe-inspiring force that contextualizes the scale of the challenge	<i>This whole area is powerful. It's just tons of energy.</i>
	lack of community expertise	Perception that community lacks necessary technical knowledge, underscoring the need for leaders who can bridge knowledge gaps	<i>Selling sweatshirts isn't going to save the coast... getting someone who's experienced writing a grant for this money and reaching out to political people.</i>
Local leaders bridging		Local leaders bridging knowledge and trust between their community and government practitioners	
	leader knowledge	Leaders having an understanding of effective adaptation approaches that allows them to translate between technical and lay audiences,	<i>She's knowledgeable about it, and I am not... I see in her the potential for success because she works very hard at it.</i>

		references to "speaking the language" of engineers and bureaucrats	
	leader vision	Leaders having clear direction or long-term goals that guide advocacy and institutional navigation	<i>She's prepared for that. She fundraised the money to build an access road... for the National Guard to come in and start.</i>
	leaders advocating	Leaders speaking up for their community's issues in government and institutional contexts	<i>We're pretty vocal about it as a team and a big shout out to the tribe down there because without the tribe's help, that's what moved a lot of the federal money.</i>
	leaders standing out	Leaders being visible to the community and/or external entities, creating a public presence for local erosion efforts	<i>I wanted to see that house that's out there. I'll not be leaving. That's the name of the house... He's got stories to tell.</i>
	navigating multiple leaders	Managing relationships between multiple leaders and stakeholders across jurisdictions	<i>You've got more stakeholders in this than I thought was possible... I am absolutely fascinated that as much work has been accomplished based on those groups coming together.</i>
	tribe securing funding	The Tribe's role as a boundary spanner in obtaining financial resources from federal agencies	<i>I feel like they got a good voice. I'm sure they're really good at getting funding and that's not a bad thing.</i>
	lack of government interest	Perceptions that government is disengaged or unconcerned with local	<i>I understand that they nixed the tsunami tower down at the Westport... the community got</i>

		issues, requiring leaders to bridge the gap	<i>together... they were able to reverse it, and now it's going to be built.</i>
	competition for outside help	Perceptions of competition between communities for adaptation support, requiring active leadership advocacy	<i>The county government as far as are we going to get the funding... because there's only so much money in the pot.</i>
Flexibility		Flexibility for local leaders and the community to implement erosion projects, specifically in relation to government oversight	
	bandaid fixes	Perception that mitigation efforts are temporary or insufficient, motivating the search for more durable experimental approaches	<i>We just keep on getting band-aids. They keep putting Band-Aids on it instead of fixing it. So we're always happy when we get some kind of help.</i>
	small rock doesnt work	Skepticism about effectiveness of small-scale rock approaches, driving experimentation with alternative strategies	<i>Today? That not working. That what they're doing is not working. That's a lot of rock, a lot of time, a lot of money.</i>
	maladaptation	Perception that some actions may worsen conditions or create new problems, informing strategy refinement	<i>I honestly believe that what happened in North Cove was a man-made mess because every time they put a new rock wall someplace along the coast here, that's going to change the way the tide's moving.</i>

	government overregulation	Perceptions that government regulations hinder informal experimentation and grassroots proof-of-concept work through permitting and bans	<i>That house that's out there, Ron's house... they went in there and tried to tell him that he was going to have to remove all of that rock. The man is trying to save his own piece of property.</i>
Drivers of engagement		Psychological (values, beliefs) and social (relationships) factors that motivate community members' decisions to engage in erosion projects	
	self-reliance	Values of independence over external help for maintaining one's health, safety, economic stability, and property	<i>I met quite a few of the [name] family. I feel like they're very independent people... they want to rely on themselves the most... they built that with their own hands.</i>
	self-preservation	Actions or priorities motivated by protecting one's own property, safety, or immediate wellbeing	<i>If it's not in terms of how is this going to benefit my operation or my neighbors... their eyes tend to glaze over a little bit.</i>
	love of rural lifestyle	Emotional attachment to the secluded and independent aspects of rural coastal life that motivates residents to protect their community	<i>You live out here for a reason. A lot of people come out here for solitude... So you have those like-minded people living around you.</i>
	sense of community	Expressions of feeling connected to and supported by community; reinforced through shared	<i>I know more of my neighbors now as I did as a kid growing up... I feel a tighter sense of community because</i>

		engagement in erosion work	<i>we're 30 miles away from town.</i>
	keeping it local	Preference for maintaining the local culture and atmosphere; resistance to outside control that motivates grassroots effort	<i>I hope we don't sell what makes this county unique.</i>
	leaders adapting for self-interest	Leaders initially acting against coastal hazards for self-preservation, which scales into community-wide leadership	<i>The tribe is doing that because they don't want to lose the road. If they lose this road, they'll lose their casino... They're doing it for their own reasons.</i>
	leadership motivation	Factors that motivate leaders to act against erosion, often rooted in personal stake and self-preservation	<i>Once we found out there was somebody that was taking it serious... they're cranberry farmers, so they had a lot of concern about it because of their cranberry fields.</i>
	acceptance of risk	Normalization of the risks associated with coastal hazards as part of the rural coastal lifestyle	<i>I guess we're at peace with it... I'm 74. Not too much. If we did lose it, I might just toast it with a glass of champagne and say adios.</i>
	lack of funding	Perception that financial limitations constrain mitigation efforts; motivates creative, self-reliant workarounds	<i>Selling sweatshirts isn't going to save the coast. It just isn't.</i>
Co-benefits		Benefits from erosion and erosion projects beyond their intended purpose	

	projects creating hope	Perception that erosion projects generate optimism about the community's future	<i>I'll be available to help. I feel like I'm part of this community, and that's something I owe to wash away no more that when they need something, I'm more than happy to help out with that.</i>
	projects uniting community	Perception that erosion projects create social cohesion and shared purpose across otherwise divided sub-communities	<i>I'll be available to help. I feel like I'm part of this community, and that's something I owe to wash away no more.</i>
	leaders removing stress	Leaders reducing uncertainty, anxiety, or worry among residents through visible action and communication	<i>It probably wasn't until today that I was like, wow. The whole community is just more happy and uplifted than it used to be... It seems brighter.</i>
	benefits of erosion	Perceptions of unexpected positive aspects arising from erosion	<i>After those houses would go in... I went out and would grab all the two by fours and two by sixes. I redid the floor in all of my studio.</i>
Responsibility Delegation		Perceptions of who is "responsible" for erosion project planning, implementation, and monitoring	
	community delegating to leaders	Community members shifting erosion management responsibility entirely to leaders, reducing broad engagement and overburdening leaders	<i>Absolutely confident. That's why I've had no desire to go in and figure out the infrastructure. If it's working, don't mess with it.</i>

	shift away from grassroots	Perception that as federal funding grows, efforts become less community-led and residents disengage from active roles	<i>I felt like it was more community back about eight years ago. When we were getting together, when everything was kind of grassroots. Once they started getting federal funding, it seemed like there was a little bit less community change.</i>
	leaders putting in time and energy	Recognition of the disproportionate time and energy burden carried by a small number of leaders	<i>People really strongly invested in that to have the time and energy and then the gumption to go forward and get awareness going on and put these projects together and try something.</i>
	reliance on community	Dependence on neighbors for health, safety, and economic stability; the collective expression of self-reliance	<i>We're 30 miles away from town. We're out here in the middle of nowhere... We got to rely on our neighbors before we rely on anybody else.</i>
Adaptive Capacity Domains		Materializations of Cinner et al. 2018's dimensions of adaptive capacity	
	Assets	financial, technological, and service resources that people have access to	<i>you look at the tax base. If we were Florida with million dollar homes on the beach, this would've never been a problem. But it's a poor community.</i>
	Organization	how North Cove is organized to enable or inhibit cooperation,	<i>we are an eclectic mix of part-timers and full-timers, so there are a lot of folks that just</i>

		collective action, and knowledge sharing	<i>aren't here very much so that I think that undermines that to a certain extent.</i>
	Learning	people's capacity to generate, absorb, and process new information about coastal hazards and adaptation options	<i>I don't think the community could gather the resources to do what's been being done without government financial input. And there's been a lot of the planning of it that has been very much assisted by the government's resources to do it. But there's also, the government wouldn't have gotten into it if there hadn't been small scale local trials.</i>
	Agency	the ability of people to have free choice in responding to coastal hazards	<i>When people own things, they, you know, they have... when they have the ability to own things, and other people do not, it definitely changes their ability to be involved in work. In the way that things are set up now.</i>