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Coastal Future CoLabs: A Transdisciplinary Framework for Justice-Oriented Coastal Erosion Management

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Abstract

With 40% of the global population living coastally, accelerating coastal erosion threatens homes, livelihoods, ecosystems, and wellbeing. Despite the global scale of coastal erosion, most prevention, mitigation, and adaptation measures are undertaken at the local scale. Local councils and municipal governments are key decision-makers in this space but often operate with limited resources. Capacity building at this scale is therefore critical to avoid top-down, reactive approaches, which often compound negative impacts on biodiversity and community wellbeing. However, adaptation and mitigation tools tailored for local governments are limited. To address this gap, we co-developed a transdisciplinary conceptual framework grounded in blue justice principles with Huon Valley Council, a local government in Tasmania, Australia, in response to the challenges and needs of a coastal community within its jurisdiction, Garden Island Creek, experiencing high rates of coastal erosion. The Coastal Future CoLabs framework emerged through this co-production process as a novel integrated tool that considers the social, environmental, and governance aspects of coastal erosion. In doing so, the framework uniquely demonstrates how local councils can be supported to foster community-based, forward-looking approaches to coastal erosion. It offers a justice-oriented, adaptable tool and process for local governments worldwide facing similar issues associated with coastal erosion.

Keywords

blue justice; coastal erosion management; coastal governance; just adaptation; local government

1. Introduction

Coastal erosion is a natural geomorphological process characterised by the landward retreat of coastlines driven by waves, tides, and storms (Intergovernmental Panel on Climate Change [IPCC], 2022). In sandy beach environments, this retreat commonly involves shoreline recession and foreshore narrowing, increasing pressure on adjacent land and infrastructure. Sea-level rise and changing storm conditions are expected to increase coastal risks globally, transforming episodic land loss into a sustained, compounding risk for coastal communities, as coastal erosion becomes an increasingly persistent socio-environmental challenge accelerated by climate change (IPCC, 2022).

Conventional responses to coastal erosion have largely been top-down, reactive approaches that prioritised technical and economic rationales. Risk-based planning, cost-benefit assessment, and asset protection frameworks commonly guide decisions regarding responses, which can often generate unintended ecological, social, and psychological consequences (Clement et al., 2024; Lawrance et al., 2022). As coastal erosion is expected to intensify, alternative approaches are needed to address risks to social stability, economic security, and community wellbeing (Elick-Barr & Smith, 2021; Lin et al., 2017).

While large-scale processes drive coastal erosion, its effects are felt locally, with associated mitigation efforts and place-based adaptation planning often falling to municipal and local governments (Warnken & Mosadeghi, 2018). However, local governments often lack sufficient resources to address coastal erosion risk effectively, leading to reactive approaches that compound negative impacts on community wellbeing (Elick-Barr & Smith, 2021; Lawrance et al., 2022). While much of the literature on coastal erosion mitigation and adaptation addresses capacity building at community, national, or international scales, few address the capacity of local governments. We aim to fill this gap by addressing the needs of Huon Valley Council (HVC), a local council responsible for supporting the community of Garden Island Creek (GIC) in Lutruwita/Tasmania, Australia, facing rapid coastal erosion.

To support HVC, we co-developed Coastal Future CoLabs (CoLabs), a transdisciplinary framework to help local councils manage, mitigate, and adapt to coastal erosion. Blue justice principles underpinned the co-development process and offer new perspectives on how action can be mobilised. The framework is grounded in the identified challenges of HVC to ensure the challenges, experiences, and needs of the GIC community are recognised and actioned upon. It aims to address the community's immediate concerns while supporting long-term, transformative governance within HVC's limited resources. The article first situates blue justice within coastal erosion management and the Australian governance context. It then outlines the collaborative development process and details the CoLabs framework. The article subsequently examines the co-development and refinement of CoLabs through the GIC case, followed by a discussion of its limitations and future directions.

2. Background

2.1. Blue Justice in Coastal Erosion Management

Blythe et al. (2023) define blue justice as “the recognition, meaningful involvement and fair treatment of all coastal people with respect to how ocean and coastal resources are accessed, used, managed and enjoyed.”

Consequently, coastal erosion management can be understood as a core domain of blue justice, given its direct implications for coastal communities. However, the blue justice literature on applying blue justice in this context remains narrow. We aim to contribute to the literature by applying it to coastal erosion management and integrating concepts and perspectives from environmental justice, climate justice, and just adaptation.

Blue justice calls for coastal populations to be recognised, included, and treated equitably in decisions on the access, use, and governance of marine and coastal resources that affect their everyday lives. It incorporates three types of justice—recognition, procedure, and distribution—to ensure that communities are respected, can meaningfully participate in relevant decision-making, and are not unfairly burdened by the negative impacts of interventions and/or change (Blythe et al., 2023). Recognition begins with acknowledging the increased vulnerability of certain populations to climate change impacts and respecting their knowledge, lived experiences, and dignity (Schlosberg & Collins, 2014). Procedural justice ensures meaningful community participation in planning and decision-making processes, moving beyond simply informing or consulting communities with limited integration in adaptation planning. Lastly, distributional justice requires that no group bears disproportionate harm if adaptation is reactive, delayed, or deferred.

Coastal erosion management raises significant justice concerns because it typically occurs through processes that perpetuate existing inequalities. It can generate recognitional injustices through top-down, inequitable decision-making; procedural injustices through the exclusion or limited participation of affected communities; and distributional injustices when adaptation measures disproportionately shift risks and harms onto other communities. Anguelovski et al. (2016) highlight these injustices in their review of adaptation strategies across eight cities, showing that disadvantaged populations disproportionately bear the burden of relocation and are adversely affected by selectively enforced regulations. Blue justice-oriented coastal adaptation planning can mitigate this by supporting fair and legitimate change while increasing active community participation (Cotton et al., 2026).

To address these institutional barriers, just adaptation provides the mechanism to achieve equitable and sustainable change while addressing injustices (Schlosberg & Collins, 2014). In coastal management, this includes shifting away from top-down, expert-led approaches that position local communities as passive recipients and tend to prioritise economic factors over broader community values and lived experiences (Cooper & McKenna, 2007). Instead, just coastal adaptation addresses the social, political, and economic structures that generate inequality and environmental injustice, centring the needs, identities, and livelihoods of those most at risk and allowing for the self-determination of these needs (Anguelovski & Corbera, 2022; Schlosberg, 2012). It also requires that local stakeholders build adaptive capacities to support just processes and engage with coastal erosion issues (Schlosberg & Collins, 2014).

Local governments play a critical role in advancing just coastal adaptation as the primary interface between communities and higher levels of government. Their position places them at the centre of distributional and procedural justice, enabling the incorporation of local knowledge, fostering meaningful community participation, and translating broader adaptation policies into locally relevant action (Kim & Kim, 2013). Despite their growing responsibilities in climate adaptation, local governments frequently operate with limited financial and institutional resources, particularly where adaptation funding and decision-making authority remain concentrated at national or state levels (Colenbrander et al., 2017). This creates distributive and procedural justice challenges not only for communities but also for local governments, which must

navigate competing expectations from local communities and higher tiers of government while lacking the resources to respond effectively. Strengthening the resources, authority, and adaptive capacity of local governments is therefore essential to achieving equitable and effective coastal adaptation outcomes.

2.2. Challenges to Coastal Erosion Management

Coastal erosion management strategies have traditionally focused on mitigating physical and economic impacts by protecting coastlines with “hard” and “soft” techniques that hold the shoreline in place (Pranzini & Williams, 2013). “Hard” techniques often include built infrastructure such as seawalls and groynes. However, the increased frequency and severity of extreme events driven by climate change can destroy these structures (Foti et al., 2020). Meanwhile, “soft” techniques often include nature-based approaches (NbA), such as native vegetation planting, coral and oyster reef restoration, and salt marsh construction (Pontee et al., 2016), which can protect coastlines or help accommodate change. While nature-based solutions (NbS) is the more widely used term, we deliberately adopt NbA in response to concerns that dominant NbS framings reinforce vested interests, treat social outcomes as by-products of measurable ecological gains, and risk superficial participation that entrenches existing power imbalances (Hafferty et al., 2025).

Existing governance arrangements shape which management strategies are appropriate based on how ecological knowledge is interpreted and operationalised within large-scale assessments and planning processes (Gracia et al., 2018). In Australia, coastal governance is distributed across multiple levels of government, frequently resulting in fragmented, overly cautious decision-making constrained by narrow economic, administrative, and legal framings that prioritise legal and political liability (Clement et al., 2024; Lin et al., 2017). These dynamics create decision-making frameworks dominated by economic rationality that systematically marginalise communities, producing injustices in smaller coastal settlements and contributing to environmental decline (Cooper & McKenna, 2007; Elrick-Barr & Smith, 2021). The absence of community- or environment-centred policy instruments across government levels further entrenches a culture of inaction (Jozaei et al., 2020). This has led to unclear roles and responsibilities among different levels of government (Elrick-Barr & Smith, 2021); inappropriate distribution of power, accountability, and liability (Jozaei et al., 2020); and a downward shift of climate adaptation obligations to local authorities and private landowners with limited guidance (Warnken & Mosadeghi, 2018).

Although local councils bear the burden of adaptation, they have received minimal resources to do so. Research on coastal erosion management is limited in its exploration of how local governments can practically navigate the social, ecological, and institutional complexities of adaptation. While numerous studies identify barriers facing local councils (Elrick-Barr & Smith, 2021; Warnken & Mosadeghi, 2018), relatively few provide actionable frameworks tailored to their decision-making context. As a result, local governments often remain responsible for managing coastal erosion but lack access to tools designed to support integrated, justice-oriented responses.

These governance arrangements have a significant impact on affected communities, including prolonged uncertainty, emotional distress, and limited opportunities for meaningful participation in decision-making (Lawrance et al., 2022). Community concerns about coastal erosion are far more pronounced than institutional responses suggest, with research highlighting the absence of relational qualities such as trust-building and acknowledgement of community fears (Clement et al., 2024; Hofmeester et al., 2012).

When governance systems fail to communicate and translate erosion management strategies clearly, this can misinform public perceptions and significantly hinder public acceptance and support for their implementation (Ernoul & Wardell-Johnson, 2013). The combination of accelerating coastal risks, institutional complexity, and community exclusion creates an urgent need for alternative approaches that build local government capacity to address the injustices exacerbated by coastal erosion.

2.3. Case Study: GIC, Lutruwita/Tasmania

GIC is a small coastal community in southern Lutruwita/Tasmania experiencing progressive foredune and beach erosion. The seaside portion of GIC comprises approximately 52 residences, of which 18 have direct beach frontage, and a mix of permanent and part-time residents whose identity and sense of place are deeply connected to the beach environment (Fractal et al., 2023). Located in the Huon Valley, the community sits within a broader national context in which coastal erosion threatens communities across Australia (Figure 1).

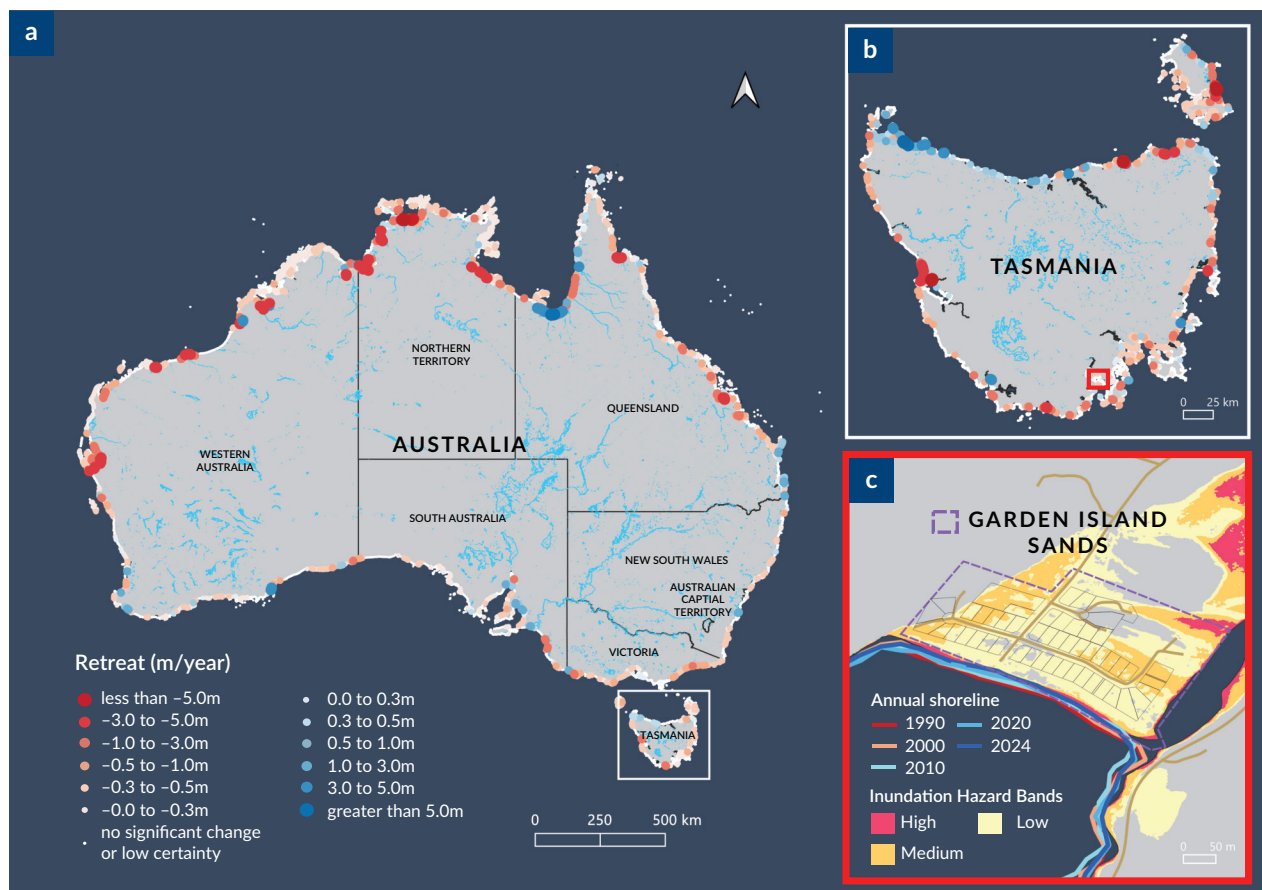


Figure 1. Map of the coastal erosion risk in (a) Australia and (b) Tasmania, and (c) coastal inundation risk for GIC. Sources: (a,b) Bishop-Taylor, 2021; (c) Lacey, 2016.

Persistent foredune recession and progressive beach volume loss driven by wind-wave action have become persistent features of the local environment, with erosion rates averaging 0.41 m per year since approximately 2000, an abrupt change from the stable or near-stable conditions observed from at least 1948 (Sharples, 2023). While sea-level rise is a gradual process, geomorphic responses at sandy beach embayments can be abrupt once a sand budget threshold is crossed, as documented at multiple Tasmanian sites (Sharples et al., 2020;

Sharples & Watson, 2025). GIC has been described as an “early responder” to sea-level rise among Tasmanian beaches (Sharples, 2023), making it both an acute local problem and a valuable indicator of what other coastal communities may face as climate impacts accelerate (Figure 2).



Figure 2. Examples of (a) the impact of wind-wave erosion on the fast-receding shoreline and (b) the proximity of the erosion line to houses and debris pile previously used as nature-based protection.

The situation at GIC is also shaped by the governance context in which responses are expected. Management responsibility at the site is fragmented across the Tasmanian Department of Natural Resources and Environment (NRE), which manages the Crown land foreshore and must approve any works upon it; HVC, which holds planning authority over private land and infrastructure; and the Tasmanian state government, which sets coastal policy and funding. This jurisdictional arrangement has not produced a funded pathway for coastal protection works. NRE, based on its interpretation of the State Coastal Policy 1996, explicitly states that the Crown is not responsible for naturally occurring erosion processes (Department of Natural Resources and Environment Tasmania, n.d.). The state government maintained that private property was not at immediate threat (Jaensch, 2021), a position that sits in tension with documented evidence of persistent shoreline recession (Sharples, 2023; Sharples & Watson, 2025). For its part, HVC has determined that it cannot assume liability, maintenance, and depreciation responsibility for coastal protection works in an active hazard zone, given its limited financial capacity (HVC, 2024). This configuration exemplifies what Elrick-Barr and Smith (2021) describe as a governance context in which policy for coastal issues is rarely intentional or substantial, and what Jozaei et al. (2020) identify as a resilience-thinking deficit in Tasmanian coastal governance more broadly.

NRE removed the foreshore’s concrete boat ramp in 2020 after it deteriorated beyond reasonable repair and HVC could not assume full liability and maintenance responsibility for the structure (HVC, 2024; Jaensch, 2021). As this was the community’s only beach point, this renewed community organising. In early 2021, the community, formalised as the Friends of Garden Island Creek (FOGIC), a registered Landcare group, secured Australian Government funding to commission geomorphic, geotechnical, natural values, and Aboriginal heritage assessments. These studies provided the first robust scientific basis for understanding local coastal processes and informed a community consultation held in January 2023, attended by approximately 40 residents, which confirmed strong and widespread support for urgent action (Fractal et al., 2023).

Drawing on this evidence, FOGIC submitted a development application in 2024 for a rock revetment and beach access ramp on Crown land. NRE denied the application under its standard Crown land policy, which requires a public entity to assume full ongoing liability, maintenance, and depreciation of any approved works. HVC declined this requirement, citing both the State Coastal Policy 1996, which assigns beach access responsibilities to NRE as Crown land manager, and the financial constraints of a small rural council taking on assets in a high-risk coastal hazard zone, despite FOGIC's willingness to pay for the construction costs (HVC, 2024; Jaensch, 2021).

Facing accelerating erosion, unresolved governance arrangements, and growing community despondency, HVC held a structured community dialogue in November 2024, bringing together FOGIC representatives, HVC staff, elected members, and Dr Chris Sharples, who conducted the assessment. Community members expressed that while the dialogue represented a meaningful step forward, it remained difficult to know what to do or how to proceed given the constraints of the existing governance system (HVC, 2024). GIC thus provides a valuable case for examining coastal erosion as a question of justice, highlighting how recognition, participation, and governance processes can shape community wellbeing outcomes.

3. Methods

3.1. Approach

This article develops an original conceptual framework to support local governments in responding to the interconnected ecological, social, and governance challenges associated with coastal erosion. The framework was developed through a transdisciplinary co-production approach involving researchers, HVC, and FOGIC. Blue justice served not only as a conceptual lens but also as a methodological guide. These principles informed participant engagement, problem identification, workshop design, and the iterative refinement of the framework. This article describes the iterative development and refinement of the framework, rather than primary qualitative findings on the success of the framework.

Co-production is understood here as an iterative, collaborative process through which researchers, governance actors, and community stakeholders collectively identify problems, contribute knowledge, and develop potential responses to complex social-ecological issues (O'Donnell et al., 2025). This approach aligns with the principles of blue justice, integrating recognitional justice through the deliberate incorporation of local knowledge, lived experience, and place-based understandings of coastal change of community and council members; procedural justice by creating opportunities for community members and HVC to define problems and shape responses jointly; and distributional justice to inform discussions regarding responsibility and resource allocation. The co-production approach taken here reflects one practical application of blue justice principles. The approach was also informed by reflexive governance, which emphasises iterative learning and collaboration when responding to complex environmental challenges (Feindt & Weiland, 2018).

3.2. Co-Development and Refinement of the Framework

The framework was developed through an iterative process of engagement, collaborative discussion, literature review, and practical refinement. Initial problem identification drew on community dialogue,

walking interviews, a review of local reports and planning documents, and discussions between HVC and community members. Consistent with recognitional justice principles, walking interviews foregrounded community members' lived experiences, local environmental knowledge, and emotional relationships with place. Conducting discussions within the landscape experiencing erosion enabled residents to identify locally significant sites, articulate observed environmental changes, and contextualise concerns that technical assessments alone may not capture (Evans & Jones, 2011).

We conducted walking interviews with community members, selected through FOGIC and broader community outreach. Participants included a mix of beachfront and non-beachfront residents. However, the sample was weighted toward active FOGIC members with sustained engagement with coastal erosion issues who acted as representatives for the wider community. Insights were documented through field notes and photographs taken during and immediately following each walk. The data were subsequently analysed through thematic coding of field notes, cross-referencing with findings from the community dialogue and workshop, and iterative discussion among the research team. While the small sample limits the representativeness of walking interview data, this method was not intended to achieve statistical coverage but rather to foreground lived experience and local environmental knowledge consistent with recognitional justice principles.

HVC and FOGIC identified three interconnected areas of concern: (a) ecological pressures associated with shoreline retreat; (b) community uncertainty and frustration regarding future coastal risks; and (c) governance challenges associated with jurisdictional complexity and institutional responsibility. While technical solutions exist for each of these dimensions, their implementation is constrained by limited resourcing and rigid, outdated decision-making frameworks. As such, the core issue is not a lack of technical knowledge, but the absence of mechanisms to collaboratively design and enact transformational adaptation pathways. Therefore, HVC, in collaboration with FOGIC, identified the need for a model that can address these interconnected challenges. Such a model must operate within existing legislative constraints—or propose realistic reforms—while simultaneously responding to immediate community needs and enabling longer-term, transformational change.

Following problem identification, the researchers conducted a targeted literature review on coastal adaptation, blue justice, NbA, citizen science, and reflexive governance to identify concepts and practices relevant to the local context. Insights from these sources were considered collectively to identify recurring ecological, social, and governance priorities that informed the emerging framework components. These components were then refined through discussions with HVC and FOGIC to ensure alignment with local governance realities, community priorities, and practical implementation constraints. Throughout this process, HVC contributed governance and implementation expertise, FOGIC contributed place-based knowledge and community perspectives, and the research team integrated these contributions with relevant literature to develop and refine the framework iteratively.

The developing framework was then used to support the co-design of community-based activities, including workshops and nature-based shoreline initiatives. Community participants were encouraged to critique proposed activities, identify priorities, and shape the framework's evolution. Participant feedback focused on the relevance, feasibility, and local applicability of proposed activities, while also identifying governance priorities and opportunities to strengthen community participation. Reflection and participant feedback generated through these activities informed iterative refinement of the framework.

An inherent power imbalance between HVC, FOGIC, and the research team shaped the co-production process. HVC held the most institutional power, balancing supporting the community, limiting its exposure to financial and legal risk, and acting as the conduit between the researchers and the FOGIC. Recognising that power asymmetries could undermine procedural justice, specific efforts were made to increase transparency and reduce information asymmetries. HVC deliberately shifted their engagement approach to an open, frequent dialogue, including regular meeting updates, and more transparent sharing of information. While this power imbalance was not fully resolved, this shift was essential to building the trust necessary for the co-production process to function. It also required HVC to accept a degree of institutional risk that not every council would be willing to take on. Meanwhile, community participants were primarily self-selected through FOGIC membership and open community invitation, with FOGIC representing a mix of permanent residents, holiday homeowners, renters, families, and younger residents. However, as is typical of community engagement in regional Tasmania, older residents were over-represented. Additionally, community participants engaged early in the process subsequently sold their properties, with the new homeowners having limited opportunities to engage.

4. Results

4.1. *The Framework: Coastal Future CoLabs*

Despite growing interest in blue justice, just adaptation, and participatory coastal governance, these strands have rarely been translated into operational frameworks that local governments can apply to coastal erosion management. To address this gap, we propose Coastal Future CoLabs (CoLabs). This transdisciplinary framework offers a new lens for integrating ecological, social, and governance activities to support community engagement in coastal erosion management. CoLabs moves beyond static perspectives and instead emerges from the lived experiences of HVC and the GIC community in responding to and mitigating coastal erosion. By building this framework on lived experiences, it integrates recognitional justice by addressing the problems and challenges co-identified by the community and council. At the same time, it remains broad enough to adapt to other areas facing similar challenges. The framework also focuses on process rather than a predetermined outcome, in contrast to most justice-focused efforts (Brousseau et al., 2024). However, just procedures increase the likelihood of long-term success in addressing existing or previous injustices. Guided by these principles, CoLabs is a unique framework centred on community wellbeing and focuses on actions that can be implemented at a community scale. In doing so, the framework recognises and prioritises community needs, supporting self-determination, and enhancing technical and emotional adaptive capacity.

CoLabs emphasises the interdependent and overlapping nature of the identified problem areas—ecological, social, and governance. This integration is visually represented by a three-circle Venn diagram (Figure 3), underscoring the importance of both sector-specific interventions and integrated responses, and the need to centre affected communities across all areas of planning and action. This integration is necessary to enable a systems-thinking and co-production approach amid complex issues. Through this co-production process, the three dimensions were iteratively brought together and refined.

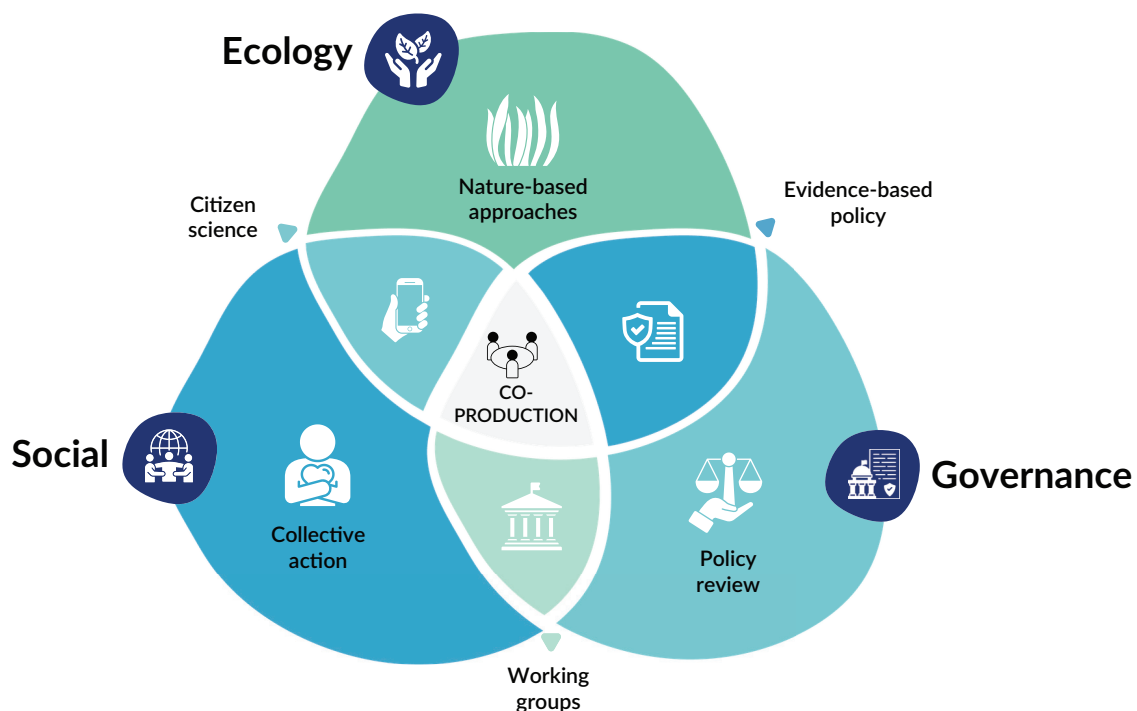


Figure 3. The CoLabs framework has three interconnected dimensions: ecology, social, and governance. The overlap among these dimensions underscores the interdependence of biophysical processes, community sentiment, and institutional coordination in shaping resilience.

The social dimension primarily advances recognitional justice by creating opportunities for communities to articulate their experiences, values, concerns, and aspirations regarding coastal erosion. Communities affected by coastal erosion often report losses in social cohesion, cultural activities, and livelihoods (Karlsson et al., 2015). In response to this, Cosentino et al. (2024) found that active participation in climate change initiatives, particularly in collective or group-based settings, can strengthen emotional resilience and reduce the risk of adverse mental health outcomes. Additionally, engagement with nature has been identified as an effective approach to addressing both eco-anxiety and ecological issues (Büchs et al., 2015).

To address the ecological challenges, NbA emerged as a viable approach that communities could implement through citizen science initiatives. Although NbA is a relatively nascent research area, its potential to significantly improve disaster risk reduction and mitigation has been internationally recognised (De Silva et al., 2022). For coastal erosion, NbA may include planting indigenous vegetation, restoring coral and oyster reefs, and salt marsh construction, with the suitability of each intervention contingent on site-specific physical conditions (Pontee et al., 2016). Meanwhile, citizen science initiatives can serve as a pathway to raise awareness, implement NbA, and improve community and personal wellbeing (Fraisl et al., 2022). Co-created “working-bee” activities, community events where a group of volunteers gather to complete a shared practical task like planting trees or building a NbA fence, can also help integrate local knowledge and address key challenges around long-term implementation and maintenance of NbA. These working-bee arrangements enable community members to move beyond consultation and become active participants in generating knowledge, implementing interventions, and shaping adaptation pathways. Such participation strengthens community agency, increases the legitimacy of resulting decisions, leverages the benefits of social connection and engagement with the environment, and enhances individual and collective

adaptive capacity. However, while NbA citizen-science initiatives can generate multiple co-benefits, their effectiveness depends on careful design and implementation to foster community trust and environmental connection (Kiss et al., 2022).

Discussions with community members also highlighted concerns about distributive justice, particularly the unequal allocation of adaptation responsibilities, resources, and risks across community members, the council, and state government agencies. This underscores the need to review existing state, regional, and local policies to identify necessary changes to address coastal erosion in ways that follow the principles of reflexive governance (Feindt & Weiland, 2018), while acknowledging the challenges of adapting to climate change. It also requires a broader, longer-term sustainability approach that explicitly engages with questions of social inclusion, fairness, and equity, while actively involving diverse actors and their differentiated values, knowledge, and lived experiences (Kiss et al., 2022). By encouraging greater transparency, collaboration, and policy reflection, CoLabs aims to improve both the fairness of decision-making processes and the distribution of adaptation responsibilities and resources.

Emerging through the co-development process at GIC, CoLabs provides local councils with a practical guide to apply blue justice principles by collaboratively designing and implementing community-scale activities that enhance community wellbeing and adaptive capacity through four phases: exploration, design, implementation, and reflection. Co-production begins at the exploration phase, with the council and community working together. Consistent with principles of recognitional justice, this phase identifies community priorities, local knowledge, lived experiences of coastal erosion, and the broader social, ecological, and governance context within which adaptation will occur. During the design phase, the council and community develop a citizen science initiative centred on a chosen NbA. Activities are delivered through a series of workshops designed to advance the ecological, social, and governance dimensions of the framework simultaneously. In line with the principle of procedural justice, the workshops prioritise dialogue, collaborative problem definition, and shared decision-making rather than consultation on pre-determined solutions. Delivering multiple workshops rather than a single event enables iterative learning, ongoing feedback, and the monitoring of changes in community sentiment, institutional collaboration, and adaptive capacity over time.

Following the design phase, the agreed activities are implemented through a coordinated programme of workshops and community action, such as the working-bee activities described above. This phase provides opportunities for procedural justice through shared learning, active participation, and collective action, while also generating tangible social and ecological adaptation outcomes. Implementation enables participants and councils to assess the effectiveness of citizen science and NbA in addressing local challenges and identify additional actions required to address emerging social or governance issues. Reflection occurs throughout implementation and continues after activities have concluded. As a core component of reflexive governance, this phase provides an opportunity to evaluate outcomes, identify successes and challenges, and incorporate participant feedback into future activities. Insights generated during this phase may prompt a return to any previous stage of the framework, facilitating continuous learning, adaptation, and improvement over time. Through this iterative cycle, CoLabs supports a more responsive, inclusive, and justice-oriented approach to local government coastal erosion management.

Because local governments are frequently expected to lead adaptation with minimal additional resourcing (Warnken & Mosadeghi, 2018), the practical value of any framework depends on whether it can be delivered within existing institutional capacity. CoLabs draws on capabilities local governments already hold rather than requiring new programs or budget lines. Its application depends on three enabling conditions: a community with existing interest in resilience building, as the framework strengthens rather than creates engagement; institutional willingness to support community-led action rather than defaulting to structural interventions; and staff time for sustained community-centred engagement.

4.2. Refinement of CoLabs at GIC

The refinement of CoLabs at GIC progressed through a series of collaborative activities beginning in September 2025. It began with the development of a short video (Figure 4a) that captured community members' attachment to the beach, concerns about the future, and experiences navigating the jurisdictional complexities described earlier in this article. This process centred on community voices, focusing on themes directly relevant to the recognition and procedural justice dimensions of blue justice, giving form to experiences that formal governance processes had consistently failed to acknowledge. HVC subsequently assisted FOGIC in planning and organising workshops, to which Coastcare members from across the Huon Valley were also invited, creating an opportunity for peer learning between community groups navigating similar challenges.

The workshops followed a structure aligned with CoLabs' three dimensions (Figure 4b). The workshops opened with community yarning, followed by an open group discussion about the beach, future concerns, and the forms of support participants needed. This created a place-based dialogue that governance processes typically fail to provide (Clement et al., 2024). Participants were then introduced to NbA, specifically the wattle fence technique co-designed in the community (Figure 4c), which links ecological learning directly to hands-on action (Cabling et al., 2024). Fence construction occupied the majority of workshop time, with the days closing over a shared meal, a design choice that can support the social cohesion essential to sustained community resilience (Lawrance et al., 2022). Residents of GIC have continued to expand the fence independently between organised events, demonstrating the community capacity that informed the ongoing refinement of CoLabs.

Critically, the co-development of CoLabs was collaborative. This situates CoLabs among approaches that uniquely consider the support required to respond to lived experiences. For instance, HVC provides ongoing support to reduce barriers to community-led action: scrap tree trimmings usually destined for green waste disposal, mulch to fill in the back of the fence, and coastal plant seedlings grown in the council's native plant nursery. This resource-sharing arrangement reflects the governance infrastructure support that the framework deems essential for NbA to be both effective and affordable over the long term (Perricone et al., 2023).

Initial feedback indicates CoLabs' potential to support community advocacy and broaden awareness. Beyond the site itself, the experience at GIC has begun to shape governance at broader scales. HVC has incorporated workshop learnings into local policies and has used this case study to advocate for changes to the State Coastal Policy. The case also informed HVC's co-development of the Coastal Hazard Resilience Planning Project, a state-wide initiative involving most Tasmanian coastal councils, delivered by the Local

Government Association of Tasmania, which aims to improve coastal community awareness and capacity to adapt to coastal risks (Local Government Association of Tasmania, 2025). This trajectory of community-led action, and the evidentiary and relational foundations it generated for institutional change, informed the governance pathway embedded within the co-developed CoLabs framework.



Figure 4. Co-development and refinement of CoLabs in GIC: (a) screenshot of advocacy video developed in collaboration with the community; (b) photo of an NbA working bee activity to protect the shoreline; (c) an innovative wattle fence designed by the community as part of the holistic NbA to shoreline protection. Note: Photographs supplied by Huon Valley Council, 2025.

5. Discussion

Co-developed through the collaborative process at GIC, CoLabs adds to climate adaptation resources as a blue justice-informed framework for local governments to support communities in adapting to the various dimensions of ecological change, bringing together approaches that are often separated in a manner that can be adapted to different contexts. The co-development process applied blue justice principles, showing how they can shape both processes and outcomes. The framework offers a new approach that centres on community wellbeing, supporting those most affected by environmental degradation, and integrates approaches that address ecological, social, and governance issues. It extends the literature on blue justice by integrating its core principles of recognition, participation, and equity into coastal erosion management in the Australian context. By creating this framework, we sought to reframe coastal erosion not only as a biophysical hazard requiring technical intervention, but also as a social and governance issue shaped by unequal power relations, institutional constraints, and differing capacities to adapt. We also seek to achieve

just adaptation by supporting communities to self-determine their needs and desired actions while enhancing their adaptive capacities. This shifts attention from what adaptation achieves to how adaptation is governed and experienced by affected communities.

CoLabs seeks to achieve recognitional justice by centring local communities in ecological management. However, GIC is not a homogeneous community. Differences in tenure, socio-economic circumstances, engagement capacity, and future aspirations shape whose perspectives are represented within participatory processes. Participation throughout the co-production process was largely self-selecting, with engagement primarily occurring through FOGIC membership and open community invitations. As a result, older and retired residents were disproportionately represented, reflecting broader patterns commonly observed in community consultation processes. While these participants provided valuable place-based knowledge and long-term perspectives on coastal change, the views and priorities of less engaged groups, including younger residents, renters, new property owners, and those with limited capacity to participate, may have been underrepresented. Ensuring that these less visible or engaged groups are recognised, therefore, remains an important consideration for GIC and future applications of CoLabs.

Relatedly, a key limitation of CoLabs is its reliance on an engaged community willing and able to participate in the process. While the framework is designed to strengthen community capacity, foster social cohesion, and encourage ongoing participation, these outcomes are difficult to achieve where community interest is weak or absent. Communities experiencing consultation fatigue, social fragmentation, limited volunteer capacity, or competing socio-economic pressures may face significant barriers to engagement, reducing the framework's effectiveness. Although local councils can play an important role in cultivating participation over time, CoLabs is likely to be most successful where some level of community organisation, interest, or willingness to engage already exists. As such, the framework should be viewed as a mechanism for building upon and strengthening existing community capacity rather than creating community engagement from scratch.

CoLabs aims to promote procedural justice by supporting community involvement in decision-making processes, equipping participants with the knowledge and capacity to navigate bureaucratic processes, and creating opportunities to shape and implement their own adaptation responses. Through involvement across ecology, social, and governance dimensions, CoLabs emerges explicitly as a framework that supports participants in moving beyond procedural inclusion and becoming active contributors to adaptation planning and action. In doing so, they may also gain the political capability to advance just adaptation (Malloy & Ashcraft, 2020). However, CoLabs cannot eliminate the structural power asymmetries between communities, local councils, and higher levels of government. Instead, it should be understood as a mechanism to support meaningful participation, collaboration, and community agency within existing governance arrangements, ideally supporting transformational change. Moreover, the framework contributes to just adaptation scholarship by operationalising recognitional and procedural justice as integral components of adaptation rather than treating justice solely as an outcome.

While CoLabs incorporates principles of distributional justice, its ability to directly address inequities in resource allocation, responsibilities, and decision-making authority is constrained by the broader governance structures within which local governments operate. The community faces increasing coastal risks despite having limited control over broader coastal governance arrangements, while HVC is expected to respond despite constrained financial and institutional capacity. This reflects a wider adaptation challenge in which

responsibilities are frequently devolved to local governments and communities without equivalent transfer of resources or authority. By making these governance arrangements visible, CoLabs helps facilitate conversations about the fair allocation of adaptation costs, risks, responsibilities, and benefits across scales of government.

CoLabs is not intended to be the sole tool to address coastal erosion, but rather a conceptual guide to support just ecological adaptation by focusing on activities around impacted communities, resulting in improved community wellbeing, social cohesion, and local capacity. Although it was co-developed through the collaborative process in response to the experiences and challenges of GIC, the social, ecological, and governance issues it addresses are widely documented across coastal adaptation contexts, suggesting that the framework may be transferable to communities facing similar interconnected challenges. Importantly, CoLabs' principal contribution is not simply integrating these three dimensions, but applying and translating blue justice principles into an operational tool local governments can use to support more equitable coastal adaptation. In this way, the framework demonstrates how justice can move from an abstract aspiration to an operational component of coastal erosion governance.

This distinguishes CoLabs from existing participatory and adaptation approaches in four respects. Conventional frameworks centre the physical hazard and its mitigation, affording less attention to community wellbeing and the political barriers that are often harder to resolve (Clement et al., 2024; Lawrance et al., 2022). Instead, CoLabs delivers ecological, social, and governance solutions as one integrated activity that small local governments can scale according to available resources. By treating justice as process design and generating advocacy evidence as a by-product of community activity, the framework also helps frame local government actions, which address a difficulty that can otherwise limit engagement and the social licence needed for transformative change (Ernoul & Wardell-Johnson, 2013).

6. Conclusion and Future Direction

The co-development and initial refinement of CoLabs at GIC provide several promising directions for future research and practice in blue justice-oriented coastal erosion management. While the framework seeks to prioritise community participation, coastal communities are not homogeneous and often have unequal power dynamics shaped by property ownership, age, socio-economic status, cultural identity, and differing capacity to engage. Therefore, the framework would benefit from comparative testing across other coastal communities facing similar interconnected challenges, both within Tasmania and across Australian and international contexts. Such comparisons would help identify which dimensions of the framework are context-specific and which are generalisable, strengthening its adaptability and enabling cross-community knowledge sharing (Paolisso et al., 2019). Acknowledging the need for engaged communities, future iterations of CoLabs may also identify underrepresented groups and investigate barriers to participation.

Expanding the participatory toolkit within the CoLabs model also represents a key opportunity. Participatory mapping has demonstrated strong potential for engaging coastal communities in understanding and communicating the ecological and social values at risk (Johnson et al., 2024), while future shoreline visualisation techniques offer a means of making abstract climate projections tangible and accessible to community members navigating uncertain futures. Integrating these tools into the CoLabs workshop structure could deepen both ecological understanding and community agency in adaptation planning.

As the work at GIC matures, building toward a collective conversation about managed retreat will become increasingly necessary. Managed retreat is frequently implemented through expert-led, top-down planning processes that inadequately account for community values, place attachment, and procedural justice (Tubridy et al., 2022). Cotton et al. (2026) further demonstrate that embedding justice principles, including recognition, procedural, and distributive justice, into long-term coastal adaptation planning is essential for building the community trust and legitimacy that effective retreat strategies require. The CoLabs model, with its emphasis on community empowerment and co-design across all three framework dimensions, is well-positioned to support this kind of justice-centred conversation before crisis conditions force the issue.

Finally, adding an economic lens to future iterations of the framework would strengthen the evidence base for advocacy and resourcing at the state and national levels. While acknowledging that community wellbeing and ecological outcomes cannot always be reduced to monetary terms, quantifying the comparative costs and benefits of integrated community-led approaches versus conventional single-infrastructure responses, as well as building on existing cost-of-risk analyses for sites like GIC, would help make the case for sustained investment in frameworks like CoLabs. Future work should prioritise empirical testing across diverse contexts, alongside strengthening policy translation to support broader application beyond localised case studies.

By applying principles from blue justice, just adaptation, and participatory coastal governance in the co-development process and outcome, the CoLabs framework offers a new perspective that reframes coastal adaptation to be centred on co-production through ecological, social, and governance dimensions simultaneously. Co-production enables resource sharing and collective problem-solving that support community wellbeing and build local capacity in ways that are responsive to institutional change. While the framework remains conceptual, its co-development at GIC demonstrates its potential to guide local councils through exploration, design, implementation, and reflection phases. This integrated approach actively considers how to respond to coastal erosion in ways that reflect recognition, procedural, and distributive justice principles. In doing so, the CoLabs framework offers a fresh narrative and a potentially transferable pathway for other coastal communities across Australia and beyond.

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Conflict of Interests

Author MJ is an employee of Huon Valley Council, which is discussed in this article. This work was conducted as part of their official duties. The authors declare no other conflict of interests.

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