Addressing Climate Equity Through Community Engagement on Virginia's Eastern Shore

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Abstract
The Eastern Shore of Virginia (ESVA) is experiencing severe climate impacts, including sea-level rise, flooding, and groundwater salinization, which disproportionately affect its rural, resource-dependent, and underserved communities. The ESVA Climate Equity Project, funded by the National Science Foundation's Coastlines and People (CoPe) program, employs a participatory framework that integrates local knowledge with scientific modelling to co-develop a climate adaptation decision-support tool. Through community workshops, stakeholder interviews, and the guidance of a diverse Community Advisory Committee, the project fosters inclusive engagement, deepens local understanding of climate risks, and strengthens collective capacity. Findings highlight the importance of addressing structural barriers, investing in civic infrastructure, and embedding local priorities into adaptation strategies. The article offers practical lessons and policy recommendations for equitable climate resilience planning in similarly at-risk coastal communities.

Key words: climate equity; community engagement; rural coastal communities

Introduction

Coastal communities are on the front lines of climate change, facing mounting risks from sea-level rise, intensifying storm events, saltwater intrusion, and hydrological variability. Rural coastal regions, in particular, are highly vulnerable due to their dependency on natural resource-based economies, limited infrastructure investment, and geographic isolation (Bhattachan et al., 2018). These areas frequently contend with aging or inadequate public systems, declining population trends, and chronic underfunding—conditions that compromise their adaptive capacity in the face of escalating climate pressures (Vogel et al., 2007; Marino, 2015).

The Eastern Shore of Virginia (ESVA) exemplifies this intersection of physical exposure and socio-institutional vulnerability. Located between the Chesapeake Bay and the Atlantic Ocean, the Eastern Shore of Virginia is a narrow peninsula experiencing one of the highest rates of relative sea level rise along the U.S. Atlantic coast, due to both global sea level rise and localized land subsidence (Sweet et al., 2022). According to the NOAA Technical Report, the Mid-Atlantic region, which includes the ESVA, is projected to experience a relative sea level rise of approximately 10 to 14 inches (0.25 to 0.35 meters) by 2050 (Sweet et al., 2022). This rate is among the highest along the contiguous U.S. coastline. The region's low elevation, shallow aquifers, and rural character make it highly susceptible to coastal and inland flooding, groundwater salinization, and septic system failures (Walker et al., 2019; DeMaria et al., 2020). These environmental hazards are compounded by socio-economic disparities, limited access to scientific resources, and fragmented governance structures—factors that hinder cohesive, long-term planning (Jurjonas & Seekamp, 2018; Commonwealth of Virginia, 2020).

This article examines these challenges through the lens of the ESVA Climate Equity Project, a National Science Foundation (NSF)-funded project aimed at fostering participatory, equity-oriented climate resilience strategies in the region. Grounded in principles of co-production, the project integrates community engagement with environmental modelling to develop a Livability Tool that supports localized climate adaptation. This article, hence, contributes to growing scholarly and policy discussions on how participatory processes can enhance addressing equity issues in changing climate and produce more just and effective climate solutions in rural regions.

These environmental threats intersect with deep-seated social inequities. The region's rural character, socio-economic disparities, and fragmented governance limit the development and implementation of long-term resilience strategies (Jurjonas & Seekamp, 2018; Commonwealth of Virginia, 2020). In response to these challenges, a participatory, equity-centred framework for co-developing climate adaptation tools with and for the community was adopted by the Eastern Shore of Virginia (ESVA) Climate Equity Project.

This article examines how the project's participatory design—anchored in co-production and sustained community engagement—has helped identify climate priorities, foster trust, and inform the development of a "Livability Tool" for local decision-making. By situating this work within broader debates on inclusion and rural

adaptation, the article contributes to a growing literature on the transformative potential of collaborative, community-centred climate planning (Norström et al., 2020; Schlosberg et al., 2017, Edizel-Tasci and Evans, 2021).

Climate Challenges in the Eastern Shore of Virginia

The Eastern Shore of Virginia is experiencing the compound effects of climate change at both severe and chronic scales. Relative sea-level rise in the Chesapeake Bay region has been measured at approximately 3–5 mm per year—nearly twice the global average—due to a combination of land subsidence and global sea level trends (Boon et al., 2010). These changes increase the frequency and severity of both coastal and inland flooding, endangering transportation infrastructure, agricultural fields, and residential properties. In addition, the region's shallow aquifer systems are becoming increasingly saline due to saltwater intrusion, threatening drinking water supplies and farm irrigation.

Climate impacts in the ESVA manifest across multiple systems. Flooding events disrupt access to schools, health services, and employment centres, while declining groundwater quality strains the viability of domestic wells and small-scale agriculture. Many households rely on decentralized wastewater systems, such as septic tanks, which are increasingly vulnerable to saturation, failure, and backflow under rising water tables (Agbasi et al, 2025). These risks are unevenly distributed, with low-income and historically marginalized communities more likely to reside in low-lying areas, lack resilient infrastructure, or face financial barriers to adaptation (Kaufman & Williams, 2021). In this way, climate impacts amplify existing structural inequities and threaten basic livelihood systems (Chang et al., 2017, Edizel-Tasci and Evans, 2021).

The region's agricultural economy—anchored in poultry, soybeans, and vegetable production—is increasingly unstable due to shifting rainfall, saltwater intrusion, and declining water quality (Bhattachan et al., 2018). Meanwhile, the physical infrastructure (roads, bridges, culverts) is aging and often ill-equipped to handle extreme weather or stormwater, which undermines both economic mobility and emergency response systems.

Disruptions to water and transportation systems intersect with public health vulnerabilities. Children, elderly residents, and migrant workers are especially at risk, particularly during heatwaves, flood events, and disease outbreaks exacerbated by compromised sanitation. For example, blocked roadways can delay emergency medical services, while overcrowded or inadequate housing can intensify exposure to environmental stressors (Jurjonas & Seekamp, 2018; Walker et al., 2019). These cascading impacts highlight the interconnectedness of environmental and social systems and underscore the urgency of coordinated, equity-focused adaptation.

Disparities in Resilience

In rural coastal regions such as the Eastern Shore of Virginia (ESVA), exposure to climate-related hazards is unevenly distributed across communities. These disparities are shaped by historical land use patterns, demographic segregation, and unequal access to basic infrastructure and planning processes. Many of the region's most at-risk populations—including long-established African American communities and Latino farmworker groups—live in low-lying areas with poor drainage and limited stormwater infrastructure, often a result of historical exclusion from safer or better-serviced zones (Schlosberg et al., 2017; Kaufman & Williams, 2021).

These communities frequently face additional barriers: substandard housing, unreliable transportation, limited access to healthcare, and low political visibility. For migrant and seasonal farmworkers, for instance, overcrowded housing, limited mobility, and temporary work arrangements reduce access to reliable climate information or emergency support (Bhattachan et al., 2018). Language barriers and precarious employment further limit access to climate information or public support systems.

This dynamic reflects what Edizel & Evans (2017) describes as the spatial and institutional marginalization of underrepresented communities—where barriers to participation are embedded in both the physical environment and the formal processes of planning. Addressing these disparities requires more than technical solutions; it calls for participatory approaches that recognize lived experience, redistribute access to decision-making, and challenge dominant narratives about urban space.

As others have noted, adaptation efforts that do not attend to these underlying disparities may inadvertently reinforce the very vulnerabilities they seek to address (Schlosberg et al., 2017). Equitable resilience planning,

therefore, must attend to questions of who is most at risk, who is heard, and how systems can be restructured to deliver fairer outcomes.

Participatory Approaches in Climate Adaptation

Participatory approaches have become central to contemporary climate adaptation strategies, particularly in regions facing complex socio-environmental challenges. Over the past three decades, scholars and practitioners have developed a wide array of methods designed to involve communities in shaping the policies, practices, and infrastructures that affect their lives. As Beierle (2002) outlined, the goals of public participation often include educating and informing the public, incorporating local values into decision-making, enhancing the substantive quality of policies, building institutional trust, and reducing conflict.

These aims are especially relevant to climate adaptation, where scientific uncertainty, local variability, and contested values converge. Participatory methods—ranging from community mapping and deliberative workshops to scenario building and citizen science—enable residents to articulate lived experiences, prioritize risks, and shape policy solutions that are contextually meaningful (Few et al., 2007; Armitage et al., 2011).

A growing body of scholarship distinguishes between levels of engagement, emphasizing that meaningful participation goes beyond informing or consulting the public. Trench (2008) and Rowe & Frewer (2005) conceptualize public engagement along a continuum—from dissemination (one-way information flow), to dialogue (two-way consultation), to full collaboration or co-production (shared decision-making and mutual learning). Chang and Moore (2017) similarly stress the importance of designing enabling conditions that support inclusive processes—particularly those that shift power and resource control toward local communities.

In the context of climate resilience, co-production has gained traction as a framework that foregrounds equity, accountability, and situated knowledge. Norström et al. (2020) define co-production as an iterative process where power, knowledge, and responsibility are equitably distributed among actors. This is not merely a methodological choice but a normative stance—aimed at disrupting hierarchical knowledge systems that historically excluded marginalized voices. Edizel & Evans (2017) reinforces this perspective through her exploration of participatory mapping, highlighting how spatial practices can reveal embedded, often invisible forms of marginalization that shape both the physical and institutional landscapes—what she frames as the politics of representation and exclusion in planning processes.

In sum, participatory approaches in climate adaptation are most effective when they are designed not only to gather input, but to reshape power dynamics, institutional relationships, and governance outcomes. As the ESVA Climate Equity Project illustrates, co-production can serve as both a method and a political commitment—one that redefines how resilience is imagined, measured, and achieved.

Methodology

The ESVA Climate Equity Project adopts a participatory engagement framework rooted in principles of knowledge co-production. Rather than treating community engagement as a supplemental or extractive component of research, this project positions engagement as central to shaping research questions, methods, and outputs (Norström et al., 2020; Turnhout et al., 2020).

The project is supported by the National Science Foundation's Coastlines and People (CoPe) program, which supports interdisciplinary, place-based research to advance climate resilience in coastal communities. A core objective of the project is the development of an open-source data and visualization platform—referred to as the Livability Tool—that integrates scientific modelling with community knowledge. This five-year (2021-2026) collaboration between the University of Virginia, Old Dominion University, and regional community leaders aims to build local capacity for climate adaptation by foregrounding lived experience, historical context, and locally relevant priorities.

The project applies co-production as both a normative and methodological commitment, engaging diverse stakeholders in all stages of the research cycle. Drawing on the work of Lemos et al. (2018) and Howell and Wilson (2018), the research design emphasizes iterative feedback processes to ensure that outputs reflect the practical needs and values of the community. A core methodological focus of the project is the integration of

local knowledge—such as lived experience, oral histories, and cultural memory—with scientific tools including spatial modelling and hydrological analysis. For instance, flooding and groundwater models were developed and refined based on insights shared during workshops. Community members provided maps and narratives documenting salinization of wells, historical drainage patterns, and land use changes that would have been otherwise invisible in top-down datasets.

The project team is also advised by a Community Advisory Committee (CAC which serves as both a governance body and a bridge between the research team and broader community. The CAC includes 12 local leaders from education, public health, planning, nonprofit, and economic sectors, including representatives from public schools, community colleges, migrant advocacy groups, and social services. CAC members play a key role in shaping research questions, advising on engagement strategies, reviewing draft deliverables for accessibility, and supporting outreach and dissemination. Their guidance ensured that community voices were embedded in all stages of tool development and public engagement.Throughout the process, the research team met regularly with the CAC to refine outreach strategies and align engagement activities with evolving community concerns. This integrated, iterative approach aimed to strengthen trust, encourage local leadership, and embed community knowledge throughout the development of adaptation tools.

Stakeholder Identification and Outreach
Stakeholders were identified through a combination of network-based and snowball sampling methods, initiated through referrals from CAC members and extended via existing community relationships. Outreach efforts included targeted emails, local event tabling, word-of-mouth, and phone calls. This approach was designed to ensure representation from across the region's geographic, socio-economic, and institutional spectrum. Participants included elected officials, school staff, tribal leaders, public health professionals, nonprofit directors, small business owners, and civic volunteers. This diversity strengthened the relevance of the engagement process and contributed to the development of locally meaningful climate adaptation resources.

Community Workshops
Three in-person community workshops were held between January 2023 and August 2024, drawing a total of over 200 participants (67 in Winter 2023, 83 in Winter 2024, and 50 in Summer 2024). Each workshop was structured as an open-house event featuring 6–8 interactive stations. Topics were developed in collaboration with community members and included:

- Sea level rise and storm surge
- Septic system vulnerability
- Groundwater depletion and salinization
- Land use history and community memory
- Climate adaptation and planning scenarios

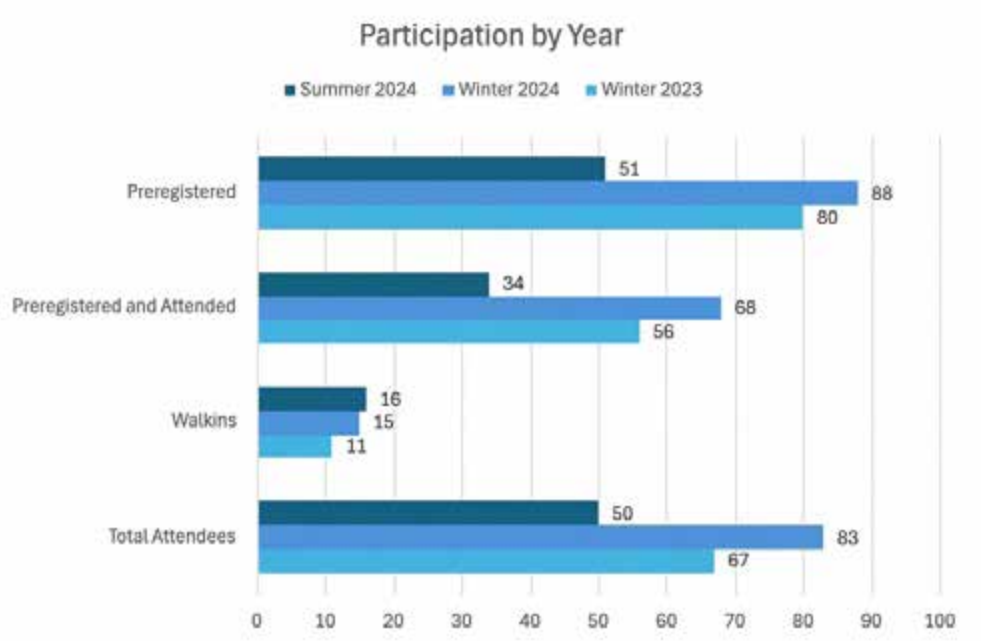

Figure 1: ESVA Workshop Participation Numbers by Years (2023-2024)

Each station was facilitated by a member of the research team. The format enabled participants to move freely, explore areas of interest, and engage in informal dialogue. Data collection methods included sticker voting, written comments, annotated maps, and structured conversation prompts (e.g., "What climate changes are you most concerned about?"). This iterative design supported multiple entry points for participation and fostered mutual learning among participants and facilitators.

Semi-Structured Stakeholder Interviews

Between September 2023 and May 2024, 20 semi-structured interviews were conducted with representatives from local government, education, public health, environmental NGOs, and media. Many of these interviewees were first introduced to the project through the workshops and later volunteered for follow-up discussions.

Interviews were designed to capture institutional perspectives on climate risk, planning processes, and community resilience needs. Each interview lasted approximately 60–90 minutes and was audio-recorded and transcribed for analysis. The interviews informed the framing of the Livability Tool and provided additional context for interpreting community engagement data.

Analysis and Discussion

The ESVA Climate Equity Project reflect a layered process of community engagement and knowledge co-production. The three community workshops—Winter 2023, Winter 2024, and Summer 2024—served not only as educational and participatory events but also as recruitment mechanisms for deeper engagement through interviews. During these workshops, community members were invited to sign up for follow-up interviews, which were conducted from September 2023 to May 2024. This sequential methodology ensured continuity between broad-based community feedback and more detailed institutional perspectives, enabling the project team to triangulate across qualitative inputs and refine project goals iteratively. The process also offers a grounded example of how participatory, equity-oriented climate research can generate meaningful insights, foster institutional trust, and support more just adaptation planning in socio-ecologically vulnerable regions.

1. Enhanced Community Understanding of Climate Risks

Throughout the engagement efforts, there has been an increase in community understanding of localized climate risks through iterative, station-based workshops and embedded institutional dialogue. The open-house format and use of visual tools (e.g., flood maps, story timeline boards) enabled participants to explore complex topics—such as groundwater salinization or septic vulnerability—in accessible and meaningful ways which emphasizes that tailored, place-based approaches foster greater comprehension and trust (Kahan et al., 2011; Lemos et

al., 2018, Edizel & Evans, 2017). Stakeholder interviews reinforced these insights, revealing how participatory activities informed internal agency conversations and community-level planning. For instance, concerns about septic system failures and saltwater intrusion—initially shared anecdotally in workshops—were later echoed by institutional actors who confirmed their growing salience in infrastructure and public health planning (See Table 1).

This convergence between community knowledge and institutional awareness aligns with Daniels and Walker's (2001) concept of Collaborative Learning, which highlights the importance of systems thinking, mutual learning, open dialogue, and constructive conflict resolution in support of adaptive decision-making. It further reflects Lemos et al.'s (2018) framing of *knowledge usability* as the central aim of co-production—emphasizing that knowledge becomes usable when it is not only credible and salient but also co-created through sustained relationships, iterative feedback, and contextual alignment with community needs. In this sense, the co-production process bridges technical expertise and lived experience, fostering actionable outcomes grounded in both scientific insight and local relevance.

Together, these participatory methods supported the ongoing calibration of scientific models with local experience and helped surface tensions between technical planning needs and lived realities. The iterative engagement strategy not only enriched the project's empirical base but also contributed to broader efforts to democratize climate adaptation. As Wyborn et al. (2019) and Fazey et al. (2014) argue, science must be co-shaped by communities if it is to advance meaningful and durable responses to complex social-environmental change.

Table 1: ESVA Resilience Priorities

Priorities identified by the Institutional Stakeholders	**Community Priority Questions Identified during the Workshop & CAC**	**Overview**
Water and Groundwater Management	How will septic systems, salinization of soils and groundwater be affected by land use change?	Stakeholders emphasized SLR's threat to infrastructure, such as the Chincoteague Causeway, and community displacement. Concerns included tourism, erosion, and uneven exposure.
Sea Level Rise and Coastal Resilience	How will sea level rise, flooding from storm surge, and intense rainfall affect ESVA communities and populations differently?	Interviewees raised concerns about septic system failures and saltwater intrusion, especially in Cape Charles and Chincoteague. Desalination is costly, and groundwater salinization threatens drinking water.
Agriculture and Land Use	What can our community do to mitigate and adapt to the effects of changes in land use and climate?	Changing rainfall patterns affect agriculture and water quality. Adaptive practices like regenerative agriculture were recommended.
Housing and Insurance Pressures	How can we create affordable retrofitting for homes and structures to withstand the increase of powerful storms and hurricanes?	Housing pressures include displacement due to short-term rentals, unaffordable insurance in flood-prone zones, and lack of affordable retrofitting options. These dynamics reflect broader vulnerabilities in coastal housing systems.
Public Health and Transportation Access	What can our community do to mitigate and adapt to the effects of changes in land use and climate?	Stakeholders advocated for mapping at-risk populations and improving rural healthcare access. Extreme heat, flooding, and lack of access to safe housing increase public health vulnerabilities were mentioned.
Community Engagement and Education	What practices would encourage and ensure input and collaboration from residents of underserved communities crucial to the planning process, and from local government officials vital to the implementation.	Stakeholders stressed the importance of youth education, decision-support tools, and inclusive processes. Initiatives aim to train residents in climate resilience.

The ESVA Climate Equity Project demonstrates how sustained engagement, shared governance, and co-production can lead to both more relevant science and more equitable adaptation outcomes. Both the workshops and interviews surfaced consistent climate resilience priorities across the community and institutional levels. The use of participatory methods to calibrate scientific models and scenario planning tools enhanced both the legitimacy and accuracy of project outputs. Rather than imposing static data products, the project adapted its design to community inputs—renaming the "Climate Equity Atlas" to the "Livability Tool," simplifying data visuals, and adding place-based filters. These changes underscore the value of participatory adaptation as not only an epistemic exercise but a procedural one that prioritizes responsiveness, relevance, and contextual sensitivity (Bremer & Meisch, 2017; Norström et al., 2020). Later workshops tested draft models, generating actionable suggestions such as clearer visuals, scenario planning, and localized data filters. Institutional interviews provided additional guidance on decision-making contexts and integration into existing planning workflows.

2. Trust-Building and Collective Action Outcomes

Trust-building emerged as both a goal and an outcome of the participatory process. In a region with a history of institutional disinvestment and marginalization, the opportunity for community members to express their perspectives and see them acknowledged served as a meaningful form of validation. The participatory nature of the project helped bridge historic divides between researchers and residents, government and underserved populations, and between institutions and lived experience. The project team's consistent responsiveness to community input—via workshops, interviews, and the advisory role of the Community Advisory Committee (CAC)—helped shift perceptions of research from extractive to collaborative.

Interviews with local leaders affirmed that consistent engagement, responsiveness to feedback, and the visible integration of community knowledge into the Livability Tool helped foster collective ownership. Trust, as defined by Leach and Sabatier (2005), is a necessary condition for collaborative capacity, particularly in politically fragmented or resource-constrained environments. These examples reflect the catalytic potential of inclusive engagement when paired with institutional alignment and sustained facilitation (Few et al., 2007; Wyborn et al., 2019).

Moreover, the project contributed to broader civic infrastructure by creating space for shared governance. The ESVA Climate Equity Project exemplifies the application of co-production in climate adaptation planning. Rather than positioning local stakeholders as passive recipients of expert knowledge, the project operationalized participatory methods through an iterative, multi-scalar design. This included the formation of a Community Advisory Committee (CAC), participatory workshops, and stakeholder interviews—all of which fed directly into the development of a Livability Tool that integrates both scientific data and community-defined priorities.

3. Barriers and Facilitators to Community Engagement

Despite success, the ESVA project encountered significant challenges associated with rural engagement: geographic isolation, transportation gaps, and uneven internet access. These barriers—identified by both community participants and institutional stakeholders—illustrate how infrastructure deficits can significantly undermine the effectiveness of otherwise well-designed participatory processes

The cross-cutting insights from workshops and interviews revealed systemic barriers to climate resilience, many rooted in long-standing inequities. For example, stakeholders noted how historical land use patterns left Black communities disproportionately exposed to flood risk, while limited transportation and digital connectivity constrain adaptation options for isolated residents. In response, the project's participatory model fostered pathways for both immediate input (e.g., through interactive workshop stations) and sustained dialogue (e.g., through advisory roles and interviews). Participants across both methods consistently emphasized the need for culturally relevant, economically accessible, and community-centred adaptation strategies.

Institutional silos posed another barrier, as many agencies struggled to coordinate across sectors (e.g., housing, health, water). However, the cross-sectoral design of the ESVA project—bringing together diverse actors in shared workshops and interviews—helped mitigate this fragmentation. As Chang and Moore (2017) note, enabling conditions for participation include institutional flexibility, relational trust, and distributed leadership, all of which were present in the CAC structure and workshop design.

Facilitators included strong local leadership, consistent CAC involvement, and the use of culturally resonant tools. By enabling participants to engage on their own terms—selecting stations, voting on priorities, and sharing experiences—the project lowered both cognitive and procedural barriers. This approach supported more inclusive engagement by fostering mutual understanding and shared meaning-making. Trench (2008) characterizes such interaction as symbolic of a participatory model of science communication—moving beyond unidirectional dissemination to emphasize reciprocal engagement, transparency, and co-constructed knowledge. By adopting this framework, the ESVA Climate Equity Project contributed to the ongoing evolution of public engagement practices, reinforcing the value of sustained dialogue and community agency in climate resilience planning.

4. Inclusive Participation Approaches for Underserved Populations

A central analytic contribution of the project is its emphasis on inclusion without dilution—ensuring broad participation while avoiding tokenism. The intentional recruitment of participants to overcome structural exclusions, as well as the CAC's diverse composition, helped counter structural exclusion.

Interviewees emphasized the importance of representation and access, noting that previously underrepresented groups now had a seat at the table—though challenges remain in sustaining participation over time. As Arnstein's (1969) classic "Ladder of Participation" model warns, engagement without real influence can breed cynicism. It also responds to the critique advanced by Schlosberg et al. (2017), who argue that adaptation must challenge the systemic marginalization embedded in planning processes themselves. The ESVA team addressed this by visibly integrating feedback into tool revisions and workshop themes.

Further, partnerships with educational institutions and local media outlets helped reduce language and accessibility barriers. The recognition that climate adaptation also requires investments in civic infrastructure—mentoring, training, and translation—demonstrates a mature understanding of participation as an ongoing process, not a one-time event (Tschakert et al., 2016; Wyborn et al., 2019).

Workshops employed a station-based open house format that invited reflection, discussion, and localized knowledge sharing. This format aligns with Edizel & Evans's emphasis on participatory mapping not just as a tool, but as a "relational and place-based practice" that strengthens community agency and makes structural inequalities visible. Similarly, Chang and Moore (2017) underscore the importance of relational trust, leadership, and institutional flexibility as enabling conditions for sustained participation—features that were embedded in the ESVA project design through continual feedback loops and collaborative decision-making.

Importantly, the project's participatory framework also addressed barriers to engagement, such as digital exclusion, transportation inequities, and language access. Rather than viewing participation as a one-off event, the project treated engagement as an ongoing process—responsive to community needs and grounded in transparency, accessibility, and respect. This echoes calls in the literature to move beyond technocratic, extractive engagement and toward dialogic, adaptive partnerships (Bremer & Meisch, 2017; Tschakert et al., 2016).

Conclusion

This paper demonstrates how participatory, place-based approaches can strengthen climate adaptation planning in rural, under-resourced coastal regions. Through community workshops, stakeholder interviews, and co-design of a decision-support tool, the project demonstrated that participatory methods are not only ethically necessary but also empirically effective in generating actionable, locally grounded adaptation strategies (Few et al., 2007; Norström et al., 2020). The integration of scientific models with community-defined priorities—facilitated through a Community Advisory Committee and iterative engagement—strengthened both the legitimacy and the usability of the Livability Tool. Beyond generating data, the project cultivated relationships, built institutional trust, and expanded the adaptive capacity of both community members and local institutions.

Policy Implications for Equitable Climate Adaptation

The ESVA experience underscores several key policy implications for equitable adaptation, particularly in underserved and rural communities:

- **Community-Driven Planning as Core Practice**: Meaningful engagement must go beyond consultation and involve co-decision-making structures. Embedding advisory committees or resident-led councils into governance processes increases legitimacy and aligns adaptation strategies with lived realities.
- **Data Democratization and Knowledge Co-Production**: Climate data must be transformed into usable formats that reflect local knowledge and priorities. Co-production frameworks support the design of tools that are both scientifically robust and socially relevant (van Kerkhoff & Lebel, 2015; Bremer & Meisch, 2017).
- **Cross-Sectoral and Multi-Level Coordination**: As seen in the ESVA case, siloed decision-making hinders effective adaptation. Adaptive governance requires cross-agency collaboration that bridges public health, housing, water, and transportation sectors (Adger et al., 2005; Armitage et al., 2011).
- **Civic Infrastructure as Climate Infrastructure**: Effective engagement depends on investments in civic infrastructure—such as translation services, facilitation training, and community organizing—not just in physical systems. Such support builds long-term capacity for adaptation (Chang & Moore, 2017).
- **Procedural and Distributive Fairness**: Without explicit mechanisms to address historical and structural marginalization, adaptation may reinforce existing inequities. Justice-oriented frameworks call for redistributive policies that prioritize frontline communities and expand access to adaptation funding and services (Schlosberg et al., 2017; Tschakert et al., 2016).

Lessons and Recommendations for Similar Coastal Communities

While climate risk is highly localized, the process lessons from the ESVA are widely applicable to other small, coastal communities grappling with sea level rise, water insecurity, and socio-economic vulnerability.

1. **Centre Community Priorities Early and Often**

Engage communities from the outset—not just to gather feedback, but to shape research questions, define engagement approaches, and guide outputs. This builds trust, legitimacy, and relevance (Reed et al., 2010). Tools like participatory mapping and story-based workshops can surface valuable localized knowledge that might otherwise be excluded (Edizel & Evans, 2017).

2. **Develop Long-Term Relationships, Not One-Off Consultations**

Avoid one-off or superficial engagement efforts. Build long-term relationships through advisory committees, recurring workshops, and feedback loops that allow communities to see how their input shapes outcomes. This fosters collective ownership and supports sustained civic capacity (Few et al., 2007).

3. **Address Structural Barriers to Participation**

Transportation challenges, limited internet access, language barriers, and institutional mistrust often block full participation. Engagement must be designed with these barriers in mind. Culturally resonant, locally hosted, and multi-lingual strategies increase accessibility (Chang & Moore, 2017; Tschakert et al., 2013).

4. **Embed Cross-Sector Collaboration**

Create engagement formats that convene stakeholders from multiple sectors—health, housing, environment, and education—together with residents. This promotes systemic understanding and supports more integrated, durable planning outcomes (Armitage et al., 2011).

5. **Treat Engagement as a Form of Adaptation Infrastructure**

Just as coastal communities invest in seawalls and drainage systems, they must also invest in the infrastructure of inclusion: facilitation, capacity building, digital access, and leadership development. These investments improve adaptive capacity and resilience over time (Lemos et al., 2018; Norström et al., 2020).

In summary, just and effective climate adaptation develops not only from scientific modelling or hazard mitigation, but also from the shared labour of co-producing knowledge, redistributing voice, and embedding equity in institutional practice. For other coastal communities seeking to navigate the complex terrain of climate change, this article offers a roadmap grounded in humility, collaboration, and the transformative potential of local leadership.

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