

Coastal Adaptation in a Changing Climate

A Pugwash Coastal Futures Workshop

Atlantic Canada, like other areas, is facing accelerating sea-level rise, stronger storms, decreasing sea ice, and accelerating, more extensive coastal erosion and flooding. Coastal adaptation reduces the risk from these processes—made more intense by climate change—but often requires difficult decisions, changes in human behavior, and agreement over shared principles to guide action.

In keeping with the Thinkers Lodge tradition of addressing complex societal challenges, a small group of international adaptation experts gathered in Pugwash, Nova Scotia, to consider guiding principles for successful coastal community adaptation both in the Maritimes and beyond. This document summarises ideas discussed across six coastal adaptation topics.

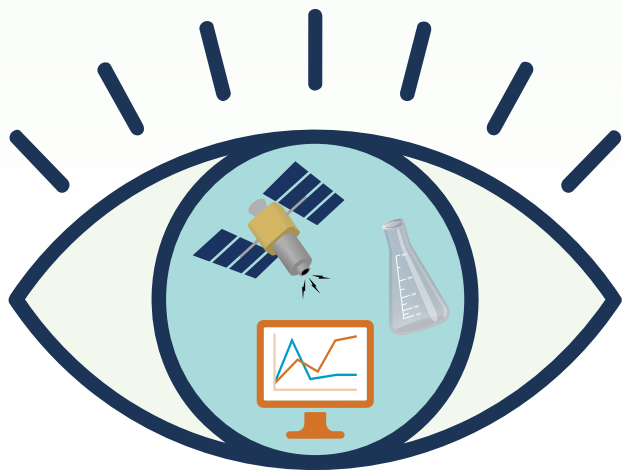
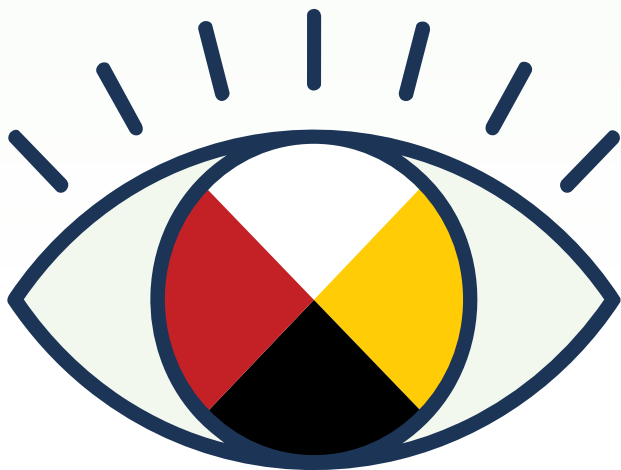
Weaving multiple ways of knowing

In the Mi'kmaw culture, people are not separate from nature but are part of it through the web of life. The Msit No'kmaq ("All My Relations") perspective inherently recognizes that societal decisions affect human communities and ecosystems upon which future generations will depend. All My Relations embodies a commitment to being good stewards of the planet by keeping it healthy for the next seven generations.

Etuptmumk, or Two-Eyed Seeing, is a guiding principle that recognizes the value of bringing together Indigenous knowledge and Western science to achieve better outcomes for complex problems. Rather than blending the two into a single knowledge system, Two-Eyed Seeing combines the strengths of both. For example, bringing together climate science and digital

mapping with lived observation, place-based experience, and inter-generational oral history. It requires a process of building trust, recognizing the value of observation over time, and collaborating to create a foundation for coastal adaptation based on knowledge and experience beyond quantitative empirical science.

Local knowledge, which may be Indigenous and non-Indigenous spanning many generations, is another important 'way of knowing'. Weaving these ways of knowing together recognizes that adaptation is not only about managing coastlines and sustainable economic development, but that it is about protecting cultural systems that have been constantly responding to changing environments. Successful adaptation is rooted in relationships, responsibility, reciprocity, and respect.



The Two-Eyed Seeing (Etuptmumk) framework was first coined by Mi'kmaw Elder Albert Marshall. Through one eye is the perspective of Indigenous knowledge, and through the other eye is the perspective of Western science. Both are valid and valuable, presenting opportunities for co-learning.

Sharing knowledge on coastal adaptation

There is a progression from data to information to knowledge. Observational and descriptive data form the primary building blocks from which, through examination and interpretation, information is developed. When processed and synthesised, this information fosters the creation of knowledge and the capability and understanding to implement effective adaptive measures.

The tendency in coastal adaptation is to share information rather than knowledge which can result in silos of knowledge held by different stakeholders without exchange between them. Effective adaptation requires combining and synthesising the siloed knowledge through building and maintaining a network of stakeholders and constructing a collective understanding.

Each contributor holds fragments of knowledge, but no single individual can determine the most effective coastal adaptation strategies alone. The objective then is to devise adaptive measures that combine various forms of expertise, which will then lead to transformative change. Creating spaces

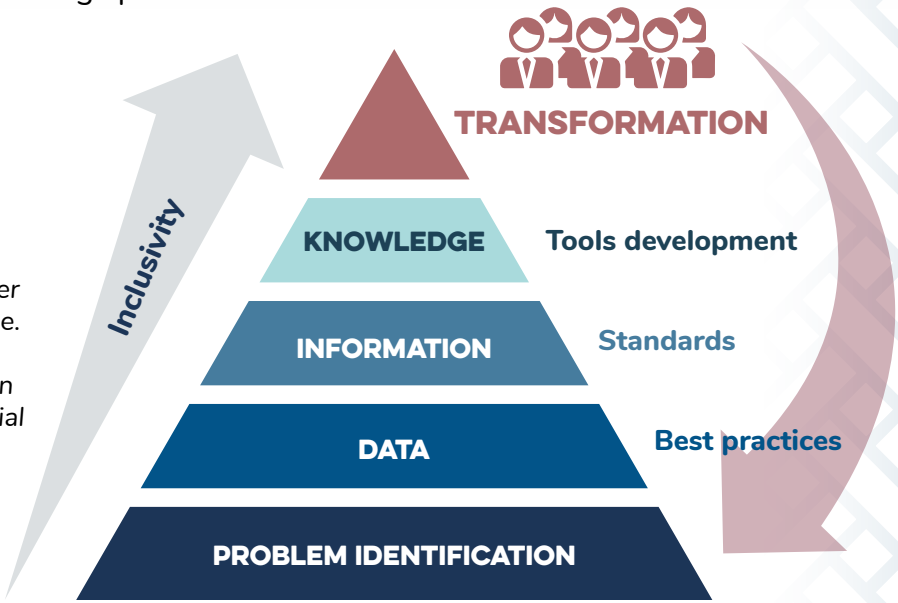


Workshop attendees walked along the Gulf Shore beach in Pugwash, Nova Scotia to discuss coastal features and adaptation needs.

and tools that facilitate transparent and trustworthy knowledge dissemination among stakeholders is crucial.

Our discussion of this topic highlighted that knowledge about coastal adaptation is intrinsically local. Adaptation efforts should reflect the local, natural, and built particularities of specific coastal segments since they are shaped by a variety of geographic features known to local stakeholders. Coastal adaptation can be most effective when it leverages local knowledge through structured collaborative efforts among all stakeholders.

Data, information, and knowledge build on one another to create transformative change. The inclusion of a variety of stakeholders in this process can ensure success and the potential for replication to help address future problems.



Building strategies together

The problems facing coastal communities due to rapid coastal change are well understood; rising sea levels, increasing storm intensity, and changing sea ice dynamics are undermining the sustainability of coastal habitation in many places. Knowledge of these issues, however, has not been enough to implement needed policies and regulations that are sensitive to local and regional needs. Barriers to creating these policies and regulations are real and center around the ability to influence political actors and policy makers to act on the knowledge that is available. But influencing the political will to address difficult issues is not easy. New ideas and new ways of creating knowledge and influence are needed.

We identified several ways forward, including maintaining the role of academics as “honest brokers”—the providers of neutral and evidence-based information. We also stressed the necessity of including a diverse range of stakeholders who possess multiple forms of knowledge and allowing activists to leverage the political ecosystem and influence decision-making. What is needed to guide informed policy making is a shared understanding of issues and concerns and the clear communication of them to policymakers and the public. Themes of co-development of knowledge, inclusion, fostering trust, community ownership, and deep engagement are important to positively influence policy and regulations to adapt to climate change.



Heather Beach is a public beach surrounded by private homes and is one of many coastal areas experiencing increasing erosion in Nova Scotia. Homeowners in the area have responded by hardening the shoreline with large boulders, which can be maladaptive and encroach on the public land.

Advice, Advocacy, Activism

Actors from a range of sectors and interests including academia, community members, non-profit organisations, citizen groups, Indigenous rightsholders, civil servants, elected politicians, and business and industry representatives all shape coastal adaptation. But they adopt different strategies about coastal adaptation when it comes to advice, advocacy, and activism.

Activism is overt action used to call for change from decision-makers. Activism often seeks to challenge the status quo, and actions can include grassroots mobilization and public protests. Advocacy is working within established systems to influence policy change, such as meeting with elected representatives or publishing policy briefs. Strategic and technical advice is typically invited by decision-makers from sources that they know and trust.

The roles of actors overlap in an ecosystem, where some individuals can change their ‘niche’ as needed, while others are more limited in their actions. While differing goals and disagreements over approaches create challenges, actors who must remain neutral brokers can do so, and activism can happen in its unique and critical space in the coastal adaptation discourse. Within this ecosystem, the various actors should cooperate to collectively advance coastal adaptation.

As the need for implementing coastal adaptation tools grows ever more urgent and decision-makers continue to be slow to respond, the role of these actors and the relationships between them will continue to be critical for advancing effective coastal adaptation.



Actors can occupy different areas of the advice, advocacy, and activism spectrum, with some having more flexibility than others. Nevertheless, each actor's role advances the cause and progress towards solutions.

Navigating governance

Governance refers to the system in which human organisations (private, public, and civic) interact to guide individual and collective decision-making. Governance involves the allocation, regulation, and enforcement of rights and obligations and the prevention and adjudication of disputes. In the Maritime provinces, authorities related to coastal governance are split between federal, provincial, and municipal governments, and do not uniformly involve Indigenous governments.

Frustrations can arise when governance leadership, whatever form it may take, presents a top-down approach and there is little equitable space created for interaction. The system of governance can then favour well-resourced organisations over more numerous yet less empowered rightsholders, and adaptation planning is conducted in the absence of key stakeholders. Partnerships across organisations with a common cause can mitigate a systemic power imbalance, and it is possible to leverage the deep knowledge and experience of each organisation and build mutual capacity.

Especially among smaller, rural communities, organising in ways that reinforce local data collection, citizen science, knowledge-building, and investment are key. Experimenting in smaller safe-to-fail ways builds capacity and empowers communities and individuals. The whole-of-society efforts that are necessary to address a climate-changed future depend on the flexing of many smaller muscles, often well ahead of those of government.

Sharing our strategies

Effective strategy communication requires honesty, humility, and clarity. Communicators should acknowledge uncertainty, be transparent about what is known and not known, and use accessible language rather than technical, data-heavy descriptions.

Communicating a strategy is not a one-time exercise—it happens regularly and seeks input for improvement. Strong strategies include regular check-ins with communities, following a clear timeline, and engaging diverse audiences. Strong strategies also include a timeline that accounts for an expectation of change as strategies evolve in response to circumstances and participants. Ongoing communication helps to maintain accountability and keeps everyone up-to-date on any changes that may be implemented to improve the strategy.

We felt that strategies should never be kept behind closed doors. Both successes and emerging challenges should be shared.

As public demand for action grows, so too does scrutiny of decisions affecting coastal areas. Careful, transparent, and ongoing communication is therefore essential to building and maintaining public trust and support over the many years required for successful strategy implementation.



Erosion, flooding, and sea-level rise degrade and damage infrastructure. Future development should be built strategically with resilient communities and infrastructure in mind.

Hosting a “Community Think”

After two days of thoughtful facilitated discussions and workshop exercises, we held a “Community Think” at Thinkers Lodge. Community members from the local area joined us to discuss adapting as Nova Scotia’s coasts change and what a future coast might look like. Following a few words on sea-level rise, coastal adaptation, and community involvement from our group of experts, the floor was opened to attendees to ask questions, make observations, and share concerns.

Several people asked about coastal processes that affect adaptation and requested more information and resources on what to do if they or their neighbours are at risk. Observations were made on the severe impacts of extreme weather events, on decreasing sea ice, increasing erosion, increased armouring of shorelines

with rock walls, and on the decline in the number of species that were once common in their area. Concerns were expressed about dramatic shifts in coastal economic activity as coastal infrastructure is lost. Citizen science initiatives were well received as an opportunity to act directly in coastal management.

Attendees indicated that with the right information, they would be in a better position to decide on the best course of action for dealing with issues like flooding and erosion. Non-profit organisations were identified as good online starting points for information on adaptation; for example, CLIMAtlantic serves as a “one-stop-shop” for climate adaptation information and coping strategies for the Atlantic Canada region and elsewhere.

“...we remember what our predecessors knew well: ultimately, when you dance with Mother Nature, she leads.”

–Dr. Jonathan Fowler, Saint Mary’s University



Community members had a chance to speak with the group of adaptation experts after the Community Think. Photo by Teresa Kewachuk.

What will you do?

Adaptation is a communal effort involving all stakeholders. Everybody can find a niche or role to play and can choose from a range of actions including virtual tools, advisory organisations (e.g. [CLIMAtlantic](#), [Ecology Action Center](#), [Green Shores](#)), and citizen science initiatives (e.g. [Coastie](#)), among others.

Perhaps you are frustrated with the decisions being made and want to participate in or donate to activism. Or maybe your niche is in advocacy for responsible and sustainable coastal development. If you are a coastal property owner, you may choose to become a local leader who is informed about nature-based strategies and can be an example for others, or your neighbourhood may want to join together and seek advice from a coastal professional.

If you are a decision-maker, you can ask yourself whether the decision you are making will increase risk for future generations. Is it limiting options for continued adaptation as climate changes? If you are in governance leadership, you can be asking whether the governance structure is equitable and transparent. Am I hearing all the voices equally? Am I providing evidence to support my policy?

Threats from climate change are real and growing at the coast, and damage and risk to coastal infrastructure from flooding and erosion, alongside growing drought and wildfire risks, will continue to increase if we do not build more robust adaptation strategies. Beginning to adapt today to the future climate will reduce the impacts over the 21st century and beyond.



This meeting builds on two previous meetings at the Thinkers Lodge in 2024 and 2025. We thank everyone involved in making this meeting possible. Left to right: Giovanni Ávila-Flores (Universidad Autónoma de Baja California Sur¹), Danika van Proosdij (Saint Mary's University²), Camilo Botero (Dalhousie University^{3,2}), Patricia Manuel (Dalhousie University²), Mitch Maracle (Nova Scotia Department of Natural Resources and Renewables²), Donald Forbes (Memorial University of Newfoundland²), Kathleen Parewick (Municipalities Newfoundland and Labrador²), Garrett Mombourquette (Parks Canada, Cape Breton Highlands National Park²), Gavin Manson (Geological Survey of Canada-Atlantic²), Heath Kelsey (University of Maryland Center for Environmental Science⁴), Nicolas Winkler (Ecology Action Centre²), Teresa Kewachuk (Thinkers Lodge²), Karly Kehoe (Saint Mary's University²), Jeff Ollerhead (Mount Allison University²), Lili Badri (University of Maryland Center for Environmental Science⁴). Team member not in photo: Melissa Labrador (Pemsik Mawa'tasikl Anko'tmu'kl^{5,2}). ¹Mexico ²Canada ³Colombia ⁴United States of America ⁵Mi'kma'ki

Document layout and design by the University of Maryland Center for Environmental Science. Cover photo by Mitch Maracle. Workshop convened by Gavin Manson, Heath Kelsey, Patricia Manuel, Melissa Labrador, Donald Forbes, and Teresa Kewachuk. Edited by Lili Badri and Gavin Manson. Contact: gavin.manson@canada.ca.



ISBN-13: 979-8-9929962-0-3
ISBN-10: 8-9929962-0-3