

2023 Arctic Coasts Workshop

Changes, Impacts, and Solutions - Working Towards a Resilient Future

October 9 – 11, 2023
University of Colorado Boulder

Report



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TABLE OF CONTENTS

LIST OF FIGURES iii

LIST OF TABLES iii

ACKNOWLEDGEMENTS iv

1. SUMMARY 1

2. GOALS, OBJECTIVES, AND TOPICS 2

3. MEETING ORGANIZATION AND ENGAGEMENT METHODS 4

4. SYNTHESIS OF PARTICIPANTS FEEDBACK..... 6

Appendix A: Workshop Agenda..... 17

Workshop Code of Conduct..... 26

LIST OF FIGURES

Figure 1. Word cloud of participant responses to “What do ‘Arctic Coasts’ mean to me” 4

Figure 2. Arctic map showing participant responses to “What place is important to your research” 4

Figure 3. Summary of responses to pre-workshop survey on workshop outcomes..... 5

Figure 4. Workshop participants shown in University of Colorado, Boulder’s Sustainability, Energy and Environment Community (SEEC) Building..... 13

Figure 5. Workshop Indigenous Panel including from left to right Shauna BurnSilver and CaSandra Johnson as moderators, Laura Thomas, Cynthia Paniyak, Reggie Tuluk, Eddie Ungott, and Qaiyaan Harcharek..... 14

LIST OF TABLES

Table 1. Workshop in-person participant groups..... 5

Table 2. 2023 Arctic Coasts Workshop In-Person Attendees (64)..... 15

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- Collaborative Research: AccelNet: Permafrost Coastal Systems Network (PerCS-Net) – a circumpolar alliance for arctic coastal community information exchange. OISE-1927553/1927137/1927373. Institutional PIs: Benjamin Jones, Ming Xiao, and Craig Tweedie.
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- NNA Track 1: Collaborative Research: NNA Research: Meq unguvatkarput (water is our livelihood) - building community resilience for the future. PI: Julie Brigham-Grette.
- NNA Track 2: Developing Arctic village resilience to changes in the water cycle, river systems, and coasts. RISE- 1927644. PI: Julie Brigham-Grette.
- NNA Track 1: Pursuing Opportunities for Long-term Arctic Resilience for Infrastructure and Society (POLARIS). RISE-1927827. PI: Guangqing Chi.

1. SUMMARY

The Arctic Coasts Workshop was held on October 9 to 11, 2023 at the University of Colorado Boulder. 64 in-person and 4 on-line participants attended the workshop. The goal of the workshop was to bring together a dynamic group of experts to exchange knowledge regarding coastal hazards and impacts, strengthen and expand partnerships, and develop actionable and immediate recommendation for Arctic research and community resilience. The scope of the workshop focused on the Arctic coastal system; this includes the natural (coastal land and near-shore ocean), engineered (coastal infrastructures), and social (coastal communities) systems. Prior to the Workshop, the participants attended an online session to identify topics and questions that were of interest to them. The participants also provided feedback on an online shared document. Based on this feedback, five specific objectives and topics were identified and discussed at the workshop. They were titled: (1) Exchange lived experience, priorities, and needs from rural community participants; (2) Exchange successful experiences on resilient community-driven projects, (3) Build partnerships to form local to international collaborative networks; (4) Identify scientific data gaps, community funding challenges and opportunities, and future goals and proposal strategies; and (5) Lay the groundwork for the newly funded NNA Collaboratory – Alaska Coastal Cooperative and other communication and research networks. Under each topic, specific questions were identified. Panel discussions and breakout group discussions focused on answering these questions. This report synthesizes the participant feedback to these specific questions.

2. GOALS, OBJECTIVES, AND TOPICS

Workshop Goal: To bring together a dynamic group of experts and knowledge holders to exchange information and observation regarding coastal hazards and impacts, strengthen and expand partnerships, and develop actionable and immediate recommendations for Arctic research and community resilience.

Scope of Workshop: The workshop focuses on the Arctic coastal system; this includes the natural (coastal land and near-shore ocean), engineered (coastal infrastructures), and social (coastal communities) systems.

Specific objectives and topics based on participant feedback and suggestions:

1) Exchange lived experience, priorities, and needs from rural community participants

[\[Participants are welcome to add notes or input for Topic 1 on this Shared Google Doc\]](#)

- What are the local priorities? What are the practical ways to exchange knowledge and apply new knowledge to meet community needs? What are the challenges to working with researchers and agencies? What are the deteriorating conditions in communities? What are the needs for infrastructure?
- How to work around community subsistence calendars to meet institutional deadlines?
- Share relocation planning experiences: what are the supports for decision-making and approaches to planning, and how do they fit in adaptation and mitigation?
- What futures are coastal communities planning for?

2) Exchange successful experiences on resilient community-driven projects.

[\[Participants are welcome to add notes or input for Topic 2 on this Shared Google Doc\]](#)

- What is working? Successful case examples, mitigation measures, practices for community resilience.
- What are the geographical and social constraints for successful cases; how to transfer successful cases to other geographical regions?
- Integrating traditional knowledge (TK) into climate change research, what work is being done to uplift TK as it complements western research.
- Green engineering applications for coastal tundra resilience and mitigation of erosion.

3) Build partnerships to form local to international collaborative networks.

[\[Participants are welcome to add notes or input for Topic 3 on this Shared Google Doc\]](#)

- How can we build and sustain effective communication networks that foster co-produced research and education beyond the scope of normal funding cycles?
- What are examples of existing and new large scale collaborative partnerships?
- How to strengthen cross-border collaborations based on shared research interests? For example, the coasts of Nunavut and northern Greenland share a very similar landscape evolution and configuration. The local communities therefore face comparable challenges in a changing climate. How can we improve bilateral knowledge exchange? What are the experiences and ideas of efficiently collaborating across projects, region, and border to achieve mutual goals?

4) Identify scientific data gaps, community funding challenges and opportunities, and future goals and proposal strategies.

[\[Participants are welcome to add notes or input for Topic 4 on this Shared Google Doc\]](#)

- What are the scientific data gaps about understanding the processes and impacts of coastal hazards? What are the available opportunities and proposal strategies to fill them?
- What are the scientific data gaps about understanding community governance and decision-making? What are the available opportunities and proposal strategies to fill them?
- What are the resources and funding opportunities for rural coastal communities? What are the challenges to getting and effectively utilizing this funding?

5) Laying the groundwork for the newly funded NNA Collaboratory - Alaska Coastal Cooperative and other communication and research networks.

[\[Participants are welcome to add notes or input for Topic 5 on this Shared Google Doc\]](#)

- How can we as a group more effectively communicate and work together to build synergy and avoid duplication of effort - what are the examples of success?
- How to create opportunities and build capacity for Indigenous communities to lead and participate in research; what are the effective strategies for building trust and requesting community input and feedback?
- What are the needs in rural coastal communities about technical training, capacity to participate, and education - What are the gaps that need to be filled to meet the needs of the future?

Themes (14)	56 respondents - 87 answers				
Meeting people/Networking	18				Build connections... to communities, researchers, stakeholders
Hear/learn about scientific results	9				Up-to-date results, erosion/flooding, stories, data, models
Learn from communities	9				CC Impacts, perspectives across commty's, steps taken, solutions
Learn about ongoing projects	8				Who is doing what and where?
Explore/Build [New]/Strengthen collaboration	7				Explore potential
Process of collaboration - How to do it?	7				Stumbling blocks to Co-Prod of Knowledge. Goals and means?
Learn how Rs can support commt'y needs...	6				...for research, recalibrating priorities, deliverables
Create new ideas/Science/Proposals	6				Shape future of coastal research, new sites, new science
Enhance science impact/Make it actionable	5				Action - No more assessments!, Commty planning
Learn/Gather/More wisdom	4				Learn all I can...coastal change, transdisciplinary... for Tribes
Research coordination	3				Reduce research fatigue, share ideas
Funding	2				Barriers to funding, where to find?
Exporting Arctic raw materials	2				Potential and challenges?
Achieve workshop objectives	1				
Total # of responses across groups		17	57	9	4

Figure 3. Summary of responses to pre-workshop survey on workshop outcomes

Table 1. Workshop in-person participant groups

Groups of participants	Numbers	Percentage (%)
Indigenous community members	12	19
Local to federal government officials	4	6
State, federal, non-profit research staff	8	13
Academia (including 7 grad students)	39	61
Youth	2	3
International participants (4 countries)	7	11

* Participants may belong to more than one group.

4. SYNTHESIS OF PARTICIPANTS FEEDBACK

Topic 1: Indigenous panel discussion on lived experience, priorities, and needs from rural community participants.

Question 1: What are the local priorities? What are the practical ways to exchange knowledge and apply new knowledge to meet community needs? What are the challenges to working with researchers and agencies? What are the deteriorating conditions in communities? What are the needs for infrastructure?

Communities prioritize adapting to climate change, addressing erosion, permafrost thaw, and the sustainability of subsistence lifestyle. Infrastructure needs, such as seawalls and improved drainage systems, are critical to adapting to these changes. Preserving and integrating traditional knowledge with scientific research is vital for sustainable and self-determined adaptation strategies. Collaboration between communities and researchers is a practical way to exchange and apply knowledge. Collaboration should emphasize on integrating local and traditional knowledge from the inception of projects. Collaboration may include co-authorship and true co-production in research. Co-authorship may lead to more comprehensive and applicable outcomes. Education and sharing within and outside communities are also a practical way to exchange and apply knowledge. However, there may be a gap between researchers and community members due to a lack of understanding and incorporation of local knowledge and needs. This gap is a challenge to working with researchers and agencies. There is also a challenge in obtaining funding and support for necessary infrastructure projects. Deteriorating conditions are witnessed by communities including severe erosion, permafrost thaw, changes in sea ice patterns, and increased storm magnitude. Infrastructure needs include seawalls and improved drainage systems to handle spring melt and prevent flooding and adaptation to infrastructure to cope with permafrost thawing and erosion. There is also a need for housing and fuel cost support. On western science researchers working with Indigenous communities, Roberta Glenn-Borade cautioned the language that western science researchers may use about climate change in Arctic communities: “Alaska Native Peoples are not a monolith. The narratives used to communicate the work should not victimize Alaska Native Peoples. Inupiat people don't see ourselves as victims of climate change, but strong, resilient, and optimistic people.”

Question 2: How to work around community subsistence calendars to meet institutional deadlines?

Integrating traditional knowledge and community needs from the beginning of projects may help align research and actions with community subsistence calendars. Active adaptation and change in practices considering environmental conditions are necessary. This requires flexible planning and funding mechanisms that can adapt to community timelines and environmental unpredictability.

Question 3: Share relocation planning experiences: what are the supports for decision-making and approaches to planning, and how do they fit in adaptation and mitigation?

Community-led initiatives show the importance of integrating community perspectives in planning and decision-making. The POLARIS Project is an example that incorporates education and local

involvement. In addition, consensus-based decision-making and consideration of spiritual needs and historical trauma are also important supports for decision-making and planning. Collaboration and sustainability are emphasized in the approaches to planning. For example, communities have been engaging in monitoring environmental changes. The need for a long-term vision that avoids band-aid solutions is highlighted, with a focus on planning for future generations. Relocation planning may directly address adaptation and mitigation needs by moving individuals, communities, or assets away from areas at high risk of climate change impacts.

Question 4: What futures are coastal communities planning for?

Communities are planning for futures that involve significant environmental changes. The significant environmental changes require adaptations to subsistence lifestyles and infrastructure. Acknowledging the need for adaptation in place due to restrictions on mobility and changing conditions may aid in a paradigm shift towards more sustainable and forward-looking planning. The role of resource allocation, capitalism, and the integration of traditional knowledge in planning are seen as crucial for shaping the futures that coastal communities are planning for.

Topic 2: Exchange successful experiences on resilient community-driven projects.

Question 1: What are the key components of successful coastal research and community resiliency projects - What is working and what is not?

The key components of successful coastal research and community resiliency projects include sharing research in ways that are accessible and aligned with community needs, respecting local culture and practices, fostering trust through community liaisons, and involving community members as co-authors, thus ensuring their perspectives are integrated. Education and outreach programs within the community, coordination among research groups, regular meetings, and transparent, open communication further strengthen these projects. However, challenges exist, such as overreliance on a single point person, difficulties posed by seasonality in grants and fieldwork, mismatched timelines, overwhelming the community, and insufficient communication from scientists to the community. Recognizing what is working and addressing these challenges is essential to the success of coastal research and community resiliency efforts.

Question 2: Integrating local and Indigenous knowledge and western knowledge around climate change, what work is being done to practice co-production of knowledge that bridges both ways of knowing and working? What are the success stories of knowledge integration?

Efforts are combining local, Indigenous, and Western knowledge to address climate change effectively. This co-production of knowledge includes intergenerational discussions, education integration, and STEAM methodologies (i.e., incorporating art into the traditionally STEM-focused approach). Furthermore, providing the opportunity for community members to serve as co-Principal Investigators in NSF-funded projects ensures shared ownership and responsibility. A core principle of knowledge co-production is obtaining permission before sharing community knowledge, guided by ethical care principles such as collective benefit, control authority, and responsibility. Governance plays a crucial role in actionable research, exemplified by sea wall

implementation based on community needs. Emphasizing humility and avoiding a unilateral Western science approach are vital. Recommendations include creating a research warehouse for internal and external stakeholders, fostering collaboration, and building on previous work. Additionally, adaptation efforts must be culturally specific, and storytelling serves as a powerful means of conveying knowledge. Success stories include the long-term projects aligned with community elders' guidance and mid-course feedback adaptation, as seen in a Canadian water quality study. Researchers' commitment, expertise in community context, and innovative methods like soundscapes recordings and photovoice are also examples of success stories of knowledge integration. In addition, building relationships, involving communities in decision-making, and establishing science advisory boards maintain strong partnerships. Success stories also include early stakeholder engagement, embedding knowledge integration in decision-making, and enhancing climate change strategies.

***Question 3:** What are effective ways of working with community needs and capacities (subsistence calendars, a deluge of new projects, over-taxed leaders/individuals, limited communication infrastructure) to ensure both sustainable co-working relationships and the meeting of institutional deadlines and other demands?*

Working effectively with community needs and capacities amidst various challenges requires a multifaceted approach. Firstly, creating space for transparent, long-term communication is essential. This involves establishing open dialogue channels for continuous feedback. Creating space for transparent communication ensures that community voices are heard and respected throughout the project. Furthermore, prioritizing community needs and understanding local subsistence calendars and aligning project timelines with these schedules are also effective ways of working with community needs and capacities. Such alignment shows commitment to the community's way of life. The effective ways of working with communities needs and capacities also include flexibility from academic institutions and researchers, recognizing challenges faced by overtaxed leaders in multitasking communities. Adapting academic tasks and deadlines fosters equitable partnerships. Researchers must adjust expectations and timelines for the community's unique circumstances. In summary, building sustainable co-working relationships while meeting demands involves transparent communication, understanding community needs, and being flexible. By addressing these considerations, researchers and institutions can form stronger, more equitable partnerships, leading to successful, mutually beneficial projects.

Topic 3: Build partnerships to form local to international collaborative networks.

***Question 1:** What are the futures we are planning for and in what time span? How do we develop communication networks and science data products that address this future?*

The future should involve indigenous rights and knowledge, diverse community perspectives considering geography, social dynamics, and economic conditions, as well as infrastructure development over various time spans. Recognizing the importance of long-term planning is vital, which varies among communities. This planning often spans generations. Climate change adaptation, sustainable resource management, and environmental conservation are pivotal. Acknowledging potential conflicts among communities is also crucial. Planning must consider

fragile infrastructure dependencies, like air transportation, to ensure resilient futures. Developing communication networks and science data products requires a holistic approach. Real-time data management, sharing, and collection are fundamental for monitoring change rates and infrastructure development. It is important to acknowledge the impact of catastrophic events on future scenario discussions. Fostering public engagement, education, and capacity building through collaboration and training is important for the development of communication networks. National and international collaboration can be strengthened to address complex regulatory challenges in decision-making. Developing visualization tools, scientific models, and maps enhance understanding of the science data products. Building resilience and redundancy into systems is necessary, as is addressing past traumas for inclusive planning. Training youth as future planners in their villages ensures continuity. Collective knowledge must become actionable plans for decision-makers, focusing on community representation. These planning efforts span personal levels, and may involve relocation due to dangers, and community levels, emphasizing the need for data to support informed decision-making.

Question 2: *What is working regarding successful communication and co-production activities across geographic scales from local to international? How can we better coordinate to avoid duplication and create synergy?*

Effective communication and co-production activities across various geographic scales involve physical meetings, shared meeting notes, weaving connections, and long-term symposiums to build trust. Linked events and information sharing between communities and policymakers enhance collaboration. Governance structures, institutional connections, and data repositories prevent duplication. Challenges include outdated international platforms, difficulty in making international connections, and virtual collaboration limitations. Training programs, overcoming grant funding barriers, and addressing communication gaps are essential. Bridging the academia-industry divide and utilizing multimedia tools can improve coordination and synergy.

Question 3: *What are the key factors in effective communication between academic and agency researchers and Tribal governments and organizations?*

Effective communication between academic and agency researchers and Tribal governments and organizations depends on several factors. These factors include making consistent phone calls and face-to-face meetings, involving Tribes in proposal development, using diverse communication modes, engaging with local governments, and understanding local intricacies. Furthermore, building relationships through personal connections and generational communication strengthens ties. Being aware of scheduling constraints and showing adaptability in the absence of meetings between academic, agency researchers, and Tribal governments and organizations are necessary. Employing diverse communication methods aids in overcoming barriers. Navigating funding restrictions and involving the community early in proposal development are essential steps. Utilizing technological outreach and maintaining institutional memory help in sustaining long-term relationships. Empowering communities through ongoing programs and culturally understanding past impacts are essential for successful collaboration. Proactive engagement and sharing research ideas foster effective partnerships.

Topic 4: Identify scientific data gaps, community funding challenges and opportunities, and future goals and proposal strategies.

***Question 1:** What are the data gaps regarding understanding the processes and impacts of coastal hazards and other environmental changes. What are the available funding opportunities and proposal strategies to fill them?*

Data gaps in understanding coastal hazards and environmental changes involve both data process gaps and data access gaps. Data process gaps encompass vital information such as sea-level monitoring, permafrost temperature, nearshore precipitation, ground ice distribution, cryopeg distributions and geochemistry, nearshore salinity, wind, wave currents and energy, groundwater level and characteristics, bathymetry, sediment fluxes, nutrient fluxes, sea ice behavior and radar coverage, and erosion and accretion rates. Data access gaps relate to challenges in accessing and aggregating data, including issues with data portals, knowledge of databases, and data storage fragmentation. Filling these gaps requires strategies such as deploying data loggers in existing drill holes, establishing automated monitoring stations, standardizing data, and harnessing diverse datasets through collaboration with communities and agencies. The “Backyard Buoys” programs can be implemented to offer communication training and ownership opportunities to enhance data collection efforts. Additionally, strategies also include spreading awareness about powerful data sources, involving hunters and communities in data collection, applying Artificial Intelligence (AI) and machine learning to transform disparate observations into continuous datasets.

***Question 2:** What are the data gaps regarding understanding community governance and decision-making. What are the available funding opportunities and proposal strategies to fill them?*

Data gaps and challenges in understanding community governance and decision-making include the definition of governance, social data deficiencies, challenges in relationship building, risk perception, and the unique nature of Indigenous governance. Additionally, there is a call for more case studies to illustrate successful governance models and the capacity of governance to address environmental changes. Strategies to address these gaps and funding opportunities include involving practitioners in funding programs, comparing top-down planning with local adaptation pathways, proposing scenarios and case studies, and adopting a broader perspective on data that includes case studies, vignettes, and stories to capture the complexities of governance and decision-making processes.

***Question 3:** What are the research priorities of communities and what resources, and funding opportunities are available to address them? What are some strategies to build local capacity to participate and be successful in proposal writing?*

The research priorities of communities are identified through frequent meetings, surveys, and interactive approaches to effectively gauge community interest. Building relationships with tribes and communities takes time, requiring multiple visits for in-depth discussions. Resources and funding opportunities to address community research priorities can be found in existing lists of plans and priorities, such as EPA tribal environmental plans and regional strategic plans like the Bristol Bay strategic plan for the environment. However, researchers need to actively seek and adapt these resources for community relevance, as plans can sometimes be disconnected from

actual needs. To build local capacity for successful proposal writing and participation, strategies include regional meetings, collaboration with organizations like the Alaska Native Tribal Health Consortium and Alaska Coastal Cooperative, hosting smaller sidebar meetings for more open discussions, fostering community interactions, and offering grant writing workshops and training that connect community members. It is crucial to ensure that communities with fewer connections are open to collaboration. Researchers play a role in quantifying and translating community knowledge into actionable plans, such as addressing coastal erosion. After research is completed, finding funding sources from foundations, the state of Alaska, NSF, and other entities can be challenging but necessary to implement the research findings effectively.

Topic 5: Laying the groundwork for the newly funded NNA Collaboratory - Alaska Coastal Cooperative and other communication and research networks.

***Question 1:** How can we as a group more effectively communicate and work together to build synergy, leverage ongoing work, and avoid duplication of effort - what are the examples of success?*

Several strategies can be employed to more effectively communicate and collaborate as a group. Firstly, it is important to recognize that duplication of efforts can sometimes be beneficial. The duplication of efforts may encourage data sharing, the exploration of multiple questions, and foster a culture of information exchange and cooperation. Leveraging existing networks and data platforms can be valuable, ensuring that data are shared openly and utilized for broader purposes. Secondly, resource sharing is essential. This includes creating accessible literature and projects, including community knowledge, in a searchable format, not limited to researchers but also accessible to community members. Establishing a database of individuals who maintain long-term, trust-based relationships with communities is crucial. Effective communication strategies, clear and jargon-free communication with the community, and regional workforce development can facilitate cooperation. Creating spaces for communication and learning through conferences, meetings, and workshops serves as platforms to build synergy, leverage ongoing work, and learn from past mistakes. Strengthening connections among various community stakeholders and using social media and local news for two-way communication can foster an informal setting for discussions, relationship building, and learning. Engaging with high schools to build student awareness of the importance of the research findings can increase the effectiveness of communication. Improving flexibility by considering researchers as flexible resources and being adaptable in research tasks and deliverables can accommodate community needs. Patience and understanding are key, as both communities and scientists have much to absorb. Providing more feedback involves reporting research progress or results to communities, municipal councils, and governments, publishing raw data regularly, and potentially making it a requirement to share data/results with communities. Emphasizing the importance of community knowledge and input in achieving scientific results can strengthen relationships. Lastly, facilitating open conversations between communities and former researchers about past work, including mistakes and strengths, can contribute to a culture of mutual learning and cooperation.

***Question 2:** How to create opportunities and build capacity for Indigenous communities to lead and participate in research; what are the effective strategies for building trust and requesting community input and feedback?*

Creating opportunities and building capacity for Indigenous communities to lead and participate in research requires a multi-faceted approach. At the community level, initial steps include forming friendships, attending local meetings, establishing early, frequent, and transparent communication, hosting social gatherings like barbecues, and involving communities in education outreach from the outset. At the grant and proposal level, challenges related to how funds are allocated and the need for fair compensation should be addressed. Community involvement should not be seen as a mere checkbox, but as a significant requirement. Proposals should include a diverse range of participants, including journalists, education coordinators, and artists, and should respect and acknowledge the existing indigenous knowledge. Continuing at the community level, active engagement of community members, younger generations, and high school students in data collection and fieldwork, along with internships, can enhance participation. Planning ahead, citing indigenous knowledge rather than exploiting it, ensuring transparent communication regarding compensation, and clarifying co-authorship expectations are essential. In terms of research communication and outreach, co-authorship, education outreach, and delivering research findings in an accessible and community-appropriate manner are crucial. Beyond traditional deliverables, considering other formats like art, news, articles, or podcasts can enhance the impact of research. Addressing the needs in rural coastal communities regarding technical training, capacity building, and education is vital. Some communities may require training in technical skills, support to enhance their capacity for active participation, and educational initiatives tailored to their unique needs. Identifying and addressing these gaps is essential for working towards a resilient future in rural coastal areas.

***Question 3:** What are the needs in rural coastal communities regarding technical training, capacity to participate, and education - What are the gaps that need to be filled to reach a resilient future?*

Several approaches can be applied to address the needs in rural coastal communities to reach a resilient future. Firstly, we must redefine what a resilient future means by enhancing communication and collaboration to avoid imposing external solutions. Solutions should be location and project specific. Secondly, successful strategies for filling gaps include making solutions and programs that align with community interests, translating scientific outcomes into on-the-ground conditions and local languages, and conducting outreach across generations with culturally relevant, place-based presentations that involve K-12 students and elders. Incorporating traditional placenames in products and outreach can also enhance relevance. Thirdly, improvements in data and technology are crucial. Utilizing crowd-sourced data, immediate visualization, and providing transferable skills that can be applied to various jobs can empower local partners and build their professional skill sets. Examples like digital stories created by youth using video equipment and sonar for mapping nearshore waters demonstrate effective approaches. However, challenges such as high turnover rates, the complexity of existing research groups and agencies, bureaucratic obstacles, and data sovereignty issues need to be addressed to fully support local, flexible solutions in rural coastal communities striving for resilience.



Figure 4. Workshop participants shown in University of Colorado, Boulder's Sustainability, Energy and Environment Community (SEEC) Building.



Figure 5. Workshop Indigenous Panel including from left to right Shauna BurnSilver and CaSandra Johnson as moderators, Laura Thomas, Cynthia Paniyak, Reggie Tuluk, Eddie Ungott, and Qaiyaan Harcharek.

Table 2. 2023 Arctic Coasts Workshop In-Person Attendees (64)

Participant Names	Affiliations	Current Positions and Roles
Alice Alipour	Iowa State University	Associate Professor of Civil Engineering
Elizabeth Aqpaluk Ahkivgak	UIC Science	Project Manager
Matthew Balazs	UAF - Alaska Coastal Cooperative	Deputy Director. Workshop co-organizer
Harper Baldwin	UAF - Arctic Coastal Geoscience Lab	Graduate Student
Rebecca Beavers	U.S. Department of Transportation	Climate Change Policy Specialist
Mette Bendixen	McGill University	Assistant Professor of Geography
Yvonne Biswokarma	Applied Research in Environmental Sciences Nonprofit, Inc (ARIES)	Research Monitor (Utqiagvik, AK)
Julie Brigham-Grette	University of Massachusetts Amherst	Professor of Geosciences
Shauna Burnsilver	Arizona State University	Assistant Professor of Environmental Anthropology. Workshop co-organizer
Billy Connor	UAF, Institute of Northern Engineering	Director, Professor of Civil Engineering
Stephanie Coulombe	Polar Knowledge Canada, Canadian High Arctic Research Station (CHARS)	Research Scientist
Kearney Coupland	St. Lawrence University	Visiting Assistant Professor of Environmental Studies
Roger Creel	Columbia University	Graduate Student, Glacial Isostatic Adjustment
Cansu Demir	University of Texas Austin	Graduate student, lagoon ecosystems
David Didier	Université du Québec à Rimouski	Professor of Northern and Arctic Coastal Studies
Tom Douglas	USACE CRREL	Senior Scientist
Matthew Druckenmiller	CU Boulder & NNA-CO	Research Scientist, Director of NNA-CO, Workshop co-organizer
Alice DuVivier	National Center for Atmospheric Research (NCAR), Project "Rising Voices Changing Coasts"	Scientist
Emily Eidam	Oregon State Univ, College of Earth, Ocean, and Atmospheric Sciences	Assistant Professor of Oceanography
Li Erikson	USGS, Pacific Coastal and Marine Science Center	Research Oceanographer
Scott Evans	North Slope Borough, Port Authority	Director
Louise Farquharson	UAF Geophysical Institute, Permafrost Laboratory	Research Assistant Professor
Casey Ferguson	UAF - Alaska Coastal Cooperative	Indigenous Community Coordinator. Workshop co-organizer.
Celso Ferreira	George Mason University	Associate Professor of Civil Engineering, Workshop co-organizer
Susan Flensburg	Alaska Coastal Cooperative	Consultant
Anne Garland	Applied Research in Environmental Sciences Nonprofit, Inc (ARIES)	Research Associate. Workshop co-organizer
Hadi Ghayoomi	George Mason University	Graduate Research Assistant of civil engineering
Roberta Glenn	UAF - International Arctic Research Center	Coordinator
Alison Gregory	CU Boulder & NNA-CO	Associate Scientist

Julia Guimond	Woods Hole Oceanographic Institute	Assistant Scientist - Coastal groundwater hydrology
Qaiyaan Harcharek	North Slope Borough	Environmental Compliance Specialist
Martin Henke	George Mason University	Graduate Student of Civil Engineering
CaSandra Johnson	Bristol Bay Native Association	Regional Indian General Assistance Program (IAGP) coordinator
Noor Johnson	CU Boulder & NNA-CO	Research Scientist
Benjamin Jones	UAF, PerCS-Net project	PI, Research Associate Professor. Workshop co-organizer
Hina Kilioni	North Slope Borough, Port Authority	Deputy Director
Kristen Krumhardt	NCAR / Rising Voices Changing Coasts	Project Scientist
Rebecca Lee	Geological Survey of Canada	Scientist
Jessica Kaagyugaq Lewis-Nicori	Alaska Pacific University & NNA-CO	Indigenous Engagement Coordinator
Tillmann Luebker	Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research	Scientist
Gregor Luetzenburg	Geological Survey of Denmark and Greenland (GEUS)	Postdoctoral Researcher
Chris Maio	UAF - Alaska Coastal Cooperative	Director, Associate Professor of Arctic Coastal Geoscience. Workshop co-organizer
Tyler Miesse	George Mason University	Graduate Student of Civil Engineering
Elise Miller-Hooks	George Mason University	Professor of Civil Engineering. Workshop co-organizer
William Nanang	Sealion Corporation - Hooper Bay	General Manager
Andy Newman	NCAR / Rising Voices Changing Coasts	Project Scientist
Nora Nieminski	Alaska DGGS	Director, Coastal Hazard Program
Mark Oggier	UAF	Postdoctoral Researcher of Sea Ice
Cynthia Paniyak	Native Village Chevak	Tribal Environmental Coordinator
Sasha Peterson	University of Texas El Paso	Graduate student of lagoon ecosystems
Andrey Petrov	University of Northern Iowa, ARCTICenter	Director, Professor of Geography. Workshop co-organizer
Julio Postigo	Indiana University	Assistant Professor of Geography
James Powell	Univ of Alaska Southeast, Alaska Coastal Rainforest Center	Research Assistant Professor of Natural Resource Policy and Sustainability Science
Vladimir Romanovsky	UAF	Professor Emeritus of Geophysics
Rodrigue Tanguay	Austrian Polar Research Institute, b.geos	Researcher
Laura Thomas	Behavioral Health, North Slope Borough	Compliance Officer
Reggie Tuluk	Native Village Chevak	Climate Coordinator
Craig Tweedie	UTEP	Professor of Environmental Science
Eddie Ungott	Native Village of Gambell	Ice observer for NNA research teams
Jenna Vater	CU Boulder & NNA-CO	Program Manager & Associate Scientist. Workshop co-organizer
Ziyi Wang	Penn State University	Graduate Student of Civil Engineering
Ming Xiao	Penn State University	Professor of Civil Engineering. Workshop co-organizer
Abigail York	Arizona State University	Professor of Governance and Public Policy. Workshop co-organizer

Appendix A

2023 Arctic Coasts Workshop Agenda

Changes, Impacts, and Solutions - Working Towards a Resilient Future

Notes:

- Many participants are listed in the agenda as contributors to the meeting. Please review whether you are going to be a co-moderator or co-group leader.
- Meeting website: <https://sites.google.com/colorado.edu/2023arcticcoastsworkshop/home>
- For virtual participation, there will be select times each day that we will use Zoom. Links are provided in the agenda.
- All times in the agenda are in Mountain Daylight Time (MDT)
- All breakfast and lunch on Monday to Wednesday are catered at the workshop venue and are free to participants. Dinner on Tuesday is at the Hilton Garden Inn and is free to participants.

Goal: To bring together a dynamic group of experts to exchange knowledge regarding coastal hazards and impacts, strengthen and expand partnerships, and develop actionable and immediate plan for Arctic research and community resilience.

Scope of Workshop: The workshop focuses on the Arctic coastal system; this includes the natural system (coastal land and near-shore ocean), engineered system (coastal infrastructures), and the social system (coastal communities).

Specific objectives and topics based on participant feedback and suggestions:

1. Exchange lived experience, priorities, and needs from rural community participants

[\[Participants are welcome to add notes or input for Topic 1 on this Shared Google Doc\]](#)

- What are the local priorities? What are the practical ways to exchange knowledge and apply new knowledge to meet community needs? What are the challenges to working with researchers and agencies? What are the deteriorating conditions in communities? What are the needs for infrastructure?
- How to work around community subsistence calendars to meet institutional deadlines?
- Share relocation planning experiences: what are the supports for decision-making and approaches to planning, and how do they fit in adaptation and mitigation?
- What futures are coastal communities planning for?

2. Exchange successful experiences on resilient community-driven projects.

[\[Participants are welcome to add notes or input for Topic 2 on this Shared Google Doc\]](#)

- What is working - Successful projects, mitigation measures, practices for community resilience.
- What are the geographical and social constraints for successful cases; how to transfer successful cases to other geographical regions?
- Integrating traditional knowledge (TK) into climate change research, what work is being done to uplift TK as it complements western research.
- Green engineering applications for coastal tundra resilience and mitigation of erosion.

3. Build partnerships to form local to international collaborative networks.

[\[Participants are welcome to add notes or input for Topic 3 on this Shared Google Doc\]](#)

- How can we build and sustain effective communication networks that foster co-produced research and education beyond the scope of normal funding cycles?
- Examples of existing and new large scale collaborative partnerships
- How to strengthen cross-border collaborations based on shared research interests? For example, the coasts of Nunavut and northern Greenland share a very similar landscape evolution and configuration. The local communities therefore face comparable challenges in a changing climate. How can we improve bilateral knowledge exchange? What are the experiences and ideas of efficiently collaborating across projects, region, and border to achieve mutual goals?

4. Identify scientific data gaps, community funding challenges and opportunities, and future goals and proposal strategies.

[\[Participants are welcome to add notes or input for Topic 4 on this Shared Google Doc\]](#)

- What are the scientific data gaps about understanding the processes and impacts of coastal hazards? What are the available opportunities and proposal strategies to fill them?
- What are the scientific data gaps about understanding community governance and decision-making? What are the available opportunities and proposal strategies to fill them?
- What are the resources and funding opportunities for rural coastal communities? What are the challenges to getting and effectively utilizing this funding.

5. Laying the groundwork for the newly funded NNA Collaboratory - Alaska Coastal Cooperative and other communication and research networks.

[\[Participants are welcome to add notes or input for Topic 5 on this Shared Google Doc\]](#)

- How can we as a group more effectively communicate and work together to build synergy and avoid duplication of effort - what are the examples of success?
- How to create opportunities and build capacity for Indigenous communities to lead and participate in research; what are the effective strategies for building trust and requesting community input and feedback?
- What are the needs in rural coastal communities about technical training, capacity to participate, and education - What are the gaps that need to be filled to meet the needs of the future?

Logistics & Transportation

Please see the separate *Logistics and Transportation Instructions* document.

Responsibilities of Panelists, Moderators, and Breakout Group Facilitators

Many workshop participants will serve as panelists, moderators for workshop panel discussions, and facilitators for breakout group discussions. Please check your names in the agenda and prepare accordingly.

- **Panel Moderators:** Moderators will lead and coordinate the panel discussions. They will prepare the questions listed in the five specific objectives and topics at the beginning of the agenda; they will coordinate the questions from all participants (if time allows); they will ensure time allocations of panel discussions.
- **Panelists:** Panelists will provide expert opinions and share experiences based on the questions from the moderators and from other participants if time allows. The questions are listed in the five specific objectives and topics at the beginning of the agenda. Panelists are expected to follow the time allocations to allow time for fellow panelists.
- **Breakout group moderators:** The moderators will remind the breakout groups what questions and topics will be focused on during the breakout sessions; they will also moderate the group report with the entire workshop.
- **Breakout group facilitators:** Two facilitators are in each breakout group and lead the group discussions. They also ensure the time allocations to ensure participation of the entire group.

October 8, 2023, Sunday

Out-of-town participants arrive in Boulder, CO.

Dinner will be on your own, though participants are encouraged to meet up for dinner. See some local dining options on the workshop website [here](#).

October 9, 2023, Monday. Workshop Day 1

Day 1 will focus on two objectives and topics:

- **Topic 1:** Exchange lived experience, priorities, needs, goals, and planning timeframes from rural community participants. Recognize *Indigenous Peoples Day*.
- **Topic 2:** Exchange successful experiences on resilient community-driven projects.

8:30 am: **Meet at hotel lobby.** Shuttle to pick up participants as needed. Participants who are driving and willing to provide rides should meet in the lobby too. We ask the participants who rent cars to please give ride to other participants as much as they can.

9:00 am: **Drop off** participants at University of Colorado Boulder's Sustainability, Energy and Environment Community (SEEC) Building. The workshop location is the SEEC Auditorium (directional signs will be posted).

9:00 – 9:30 am: **Breakfast** served at the Auditorium.

9:30 – 9:45 am: **Welcome**, workshop goals, expected outcomes, agenda, and meeting plan.

Ming Xiao and Matthew Druckenmiller

9:45 – 11:00 am: **Introductions and Discussion:** *What do “Arctic Coasts” mean to me?*

Moderators: Abby York, Casey Ferguson, Shauna BurnSilver



Web
PollEv.com/shaunaburnsilver925

Join by Text
Send *shaunaburnsilver925* to 22333

[Zoom link \(requires registration\)](#)

Zoom coordinators: *Jenna Vater, Anne Garland*

11:00 – 11:15am: **Coffee Break**

11:15am – 12:15pm: **Topic 1 - Knowledge Exchange of Lived Experience - Panel Discussion**

Moderators: *CaSandra Johnson and Shauna BurnSilver*

Panelists: *Cynthia Paniak, Reggie Tuluk, Eddie Ungott, Laura Thomas, and William Nanang*

Panelists will give introductory remarks for around 5 minutes. Then moderators will ask panelists topic questions shown at the beginning of the Agenda. If time allows this will be followed by questions and comments from the audience.

[Zoom link \(requires registration\)](#)

Zoom coordinators: *Jenna Vater, Anne Garland*

12:15 – 1:15 pm: Catered **Lunch** at SEEC Building

1:15 – 2:15 pm: **Topic 2 - Breakout groups discussions** (4 groups): 15 minutes per question, each group answers all three questions

Moderators: *Casey Ferguson, Shauna BurnSilver*

Group Facilitators - 1) *Elizabeth Ahkivgak and Yvonne Biswokarma*; 2) *Susan Flensburg and William Nenang*; 3) *Harper Baldwin and Kearney Coupland*; 4) *Hina Kiloni and Scott Evans*

Question 1: *What are the key components of successful coastal research and community resiliency projects - What is working and what is not?*

Question 2: *Integrating local and Indigenous knowledge and western knowledge around climate change, what work is being done to practice co-production of knowledge that bridges both ways of knowing and working? What are the success stories of knowledge integration?*

Question 3: *What are effective ways of working with community needs and capacities (subsistence calendars, a deluge of new projects, over-taxed leaders/individuals, limited communication infrastructure) to ensure both sustainable co-working relationships and the meeting of institutional deadlines and other demands?*

2:15 – 3:00 pm - **Group reporting and Open Discussion**

Moderators: *Elise Miller-Hooks, Alice DuVivier*

3:00 - 3:30 pm - **Coffee Break**

3:30 - 4:00 pm - **Brainstorm Session** and Open Discussion on Emergent Themes to be covered on Day 3 - *Transfer knowledge and experiences to decision making and plan the future - what do we want to get out of this meeting?* Use responses from pre-survey as starter for discussion.

Moderators: *Anne Garland, Shauna BurnSilver, Laura Thomas*

4:00 – 4:30 pm - **Summary of Day 1** and main outcomes - what to look forward to tomorrow.

Ming Xiao and Matthew Druckenmiller

[Zoom link \(requires registration\)](#)

Zoom coordinators: *Jenna Vater, Anne Garland*

4:30 pm: **End of Day 1.** Shuttle service to hotels.

6:00pm: Optional **Dinner** gathering at [Rayback Collective](#).

Light dinner foods will be provided in our reserved event space. Food trucks at the venue provide a range of further dinner options. Door prizes will be awarded! **The Rayback** is Boulder's only food truck park, with a full bar, tap house, coffee shop, and pup zone. Transportation will be provided.

October 10, 2023, Tuesday. Workshop Day 2

Day 2 will focus on two objectives and topics:

- **Topic 3:** Build partnerships to form local to international collaborative networks.
- **Topic 4:** Identify scientific data gaps, community funding challenges and resources, and future goals and proposal strategies.

8:30 am: **Meet at hotel lobby.** Shuttle to pick up participants as needed. Participants who are driving and willing to provide rides should meet in the lobby too.

8:45 am: **Drop off** participants at SEEC Building

8:45 – 9:15 am: **Breakfast**

9:15 – 9:30 am: **Recap Day 1 - Review Day 2 agenda**, plan, and expected outcomes

Ben Jones and Ming Xiao

9:30 – 10:45 am: **Topic 3 -Group Discussion Themes**

(There will be 3 groups covering three separate topics. Each participant will choose a group to join. Each group will have two co-leads)

Moderators: *Abby York, Andy Newman*

Group 1 Question: *What are the futures we are planning for and in what time span? How do we develop communication networks and science data products that address this future?*

Group Co-Leads: *Julie Brigham-Grette and Gregor Luetzenburg*

Group 2 Question: *What is working in regards to successful communication and co-production activities across geographic scales from local to international? How can we better coordinate to avoid duplication and create synergy?*

Group Co-Leads: *Tillmann Luebker and Mette Bendixen*

Group 3 Question: *What are the key factors in effective communication between academic and agency researchers and Tribal governments and organizations?*

Group Co-Leads: *CaSandra Johnson and Roberta Glenn*

10:45 – 11:00 am: **Coffee Break**

11:00 am – 11:30 pm: **Group Reporting and Open Discussion on Topic 3**

Moderator: *Abby York*

11:30 am – 12:00 pm: Science Talks

- “Emerging Alaska-based coastal engineering and research projects.” *Tom Douglas*
- “Navigating variability: Community process towards actionable governance with ARC NAV.” *Abby York, Shauna BurnSilver, Eddie Ungott*

12:00 – 1:00 pm: Catered **Lunch** at SEEC Building

1:00 – 1:15 pm: Youth Science Talk: “Community Erosion Monitoring.” *Violet Thomas, Jasmine Biswokarma.*

1:15 – 2:15 pm: **Topic 4 Group Discussion Themes** (There will be 3 groups covering three separate topics. Each participant will choose a group to join. Each group will have two co-leads)

Moderators: *Tom Douglas and Louise Farquharson*

Group 1 Question: *What are the data gaps in regards to understanding the processes and impacts of coastal hazards and other environmental changes. What are the available funding opportunities and proposal strategies to fill them?*

Group Co-Leads: *Louise Farquharson and Nora Nieminski*

Group 2 Question: *What are the data gaps in regards to understanding community governance and decision-making. What are the available funding opportunities and proposal strategies to fill them?*

Group Co-Leads: *Shauna BurnSilver and Abby York*

Group 3 Question: *What are the research priorities of communities and what resources and funding opportunities are available to address them? What are some strategies to build local capacity to participate and be successful in proposal writing?*

Group Co-Leads: *Chris Maio and Susan Flensburg*

2:30 – 3:00 pm: **Group Reporting and Open Discussion on Topic 4**

Moderators: *Tom Douglas and Louise Farquharson*

3:00 – 4:00 pm: **Coffee Break - Side Meetings and Open Discussion**

4:00 – 4:30 pm: **Summary of Day 2** and main outcomes. Discuss follow-up coordination that leads to 2024 NNA Annual Community Meeting in Washington D.C. on Mar 5-7, 2024.

Matthew Druckenmiller and Ming Xiao

[Zoom link \(requires registration\)](#)

Zoom coordinators: *Jenna Vater and Anne Garland*

4:30 pm: **End of Day 2.** Shuttles pick up participants and drop off at hotels.

6:00 pm: **Group Dinner.** A catered dinner will be provided at the Banquet Hall of the [Hilton Garden Inn](#). Door-prizes and a cash-bar will be available.

October 11, 2023. Wednesday. Workshop Day 3

Day 3 will focus on one objective and topic:

- **Topic 5:** Laying the groundwork for the newly funded NNA Collaboratory - Alaska Coastal Cooperative and other communication and research networks

8:30 am: **Meet at hotel lobby**, Shuttle to pick up participants as needed. Participants who are driving and willing to provide rides should meet in the lobby too.

8:45 am: **Drop off** participants at SEEC Building

8:45 – 9:15 am: **Breakfast**

9:15 – 9:30 am: **Recap Day 2 and Review Day 3 agenda**, plan, and expected outcomes

Ming Xiao

9:30 – 10:30 am: **Topic 5 - Panel Presentations**

(Panelists will give introductory remarks for around 5 minutes. Then moderators will ask panelists topic questions shown at the beginning of the Agenda. If time allows this will be followed by questions and comments from the audience)

Moderators: *Matthew Balazs and Li Erikson*

Panelists: *Chris Maio, Billy Conner, Eddie Ungott, and Andrey Petrov*

[Zoom link \(requires registration\)](#)

Zoom coordinators: *Jenna Vater, Anne Garland*

10:30 – 10:45 am: **Coffee Break**

11:00 am – 12:00 pm: **Breakout group discussion on Topic 5** (4 groups): 15 minutes per question, each group answers all 3 questions and is led by two co-leads.

Group Facilitators - 1) *Julia Guimond and Craig Tweedie*; 2) *Noor Johnson and Alison Gregory*; 3) *Qaiyaan Harcharek and Celso Ferreira*; 4) *Mark Oggier and Rodrigue Tanquey*

Question 1: *How can we as a group more effectively communicate and work together to build synergy, leverage ongoing work, and avoid duplication of effort - what are the examples of success?*

Question 2: *How to create opportunities and build capacity for Indigenous communities to lead and participate in research; what are the effective strategies for building trust and requesting community input and feedback?*

Question 3: *What are the needs in rural coastal communities in regards to technical training, capacity to participate, and education - What are the gaps that need to be filled to reach a resilient future?*

12:15 – 1:15 pm: Catered **Lunch** at SEEC Building

1:15 – 2:30 pm: **Emergent Topics: Breakout Groups Report** (with all participants)

Science Talks:

- “Lessons in Point Lay on Permafrost and Infrastructure.” *Billy Connor and Ben Jones*
- “Coastal Flood Hazards” *Li Erikson*
- “Documenting Event-driven Erosion on the Arctic Coast in Wainwright.” *Nora Nieminski*
- Youth Science Talk: “Tundra for Health, Heritage, and Hazard Reduction.” *Violet Thomas, Jasmine Biswokarma.*
- “The Arctic Landscape EXplorer (ALEX) – providing easy access to scientific data on long-term landscape changes.” *Tillmann Lübker*

Moderator: *Emily Eidam*

2:30 – 3:30 pm: **Coffee Break - Side Meetings and Free Discussion Time**

3:30-4:00 pm: **Conclusion.**

Workshop Organizing Committee members

[Zoom link \(requires registration\)](#)

Zoom coordinators: Jenna Vater, Anne Garland

4:00 pm: **End of Day 3.** Shuttles pick up participants and drop off at hotels.

Some out-of-town participants may choose to leave Boulder.

Dinner to be self-arranged.

October 12, 2023, Thursday

The rest of out-of-town participants leave Boulder.

Participants feel free to arrange their own transportation back to Denver International Airport. We will contact those who rent cars and can give ride to others whose flights are at similar time.

Workshop Code of Conduct

A Code of Conduct is a set of expectations agreed upon by a group to support creating a positive environment for collaboration and to help prevent harm to individuals who participate. Workshop organizers suggest the following code of conduct for the workshop, which we will be sharing and reminding participants at the opening of the workshop.

We ask that all workshop participants commit to:

- Treating all participants with respect and consideration
- Recognizing the wisdom and contributions of Elders
- Recognizing the value of diverse perspectives
- Making space for others to share
- Listening deeply so that we can learn from each other
- Acknowledging the contributions of others
- Keeping any personal or confidential information within the group

Any form of action or behavior that makes any participant feel uncomfortable, unwelcome, or that their ideas and contributions are not valued goes against our code of conduct. This includes any physical threats, harassment, sexual attention or advances, personal attacks, and hostile comments.

If you witness or experience any of these behaviors, please let Ming Xiao or Matthew Druckenmiller know so that we can take action.