The 2025 Sustainable Arctic Shipping Knowledge Exchange (SASKE) Workshop Report

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MEOPAR funded Community of Practice

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Notices

This report reflects the views of the authors and not necessarily those of our funders and partners. Intellectual Property of project results remain with the authors.

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Background and Workshop Context

Shipping activity across Inuit Nunangat has increased by more than 250% since 1990 (Dawson et al., 2018), with further growth expected as climate-driven reductions in sea ice make Arctic waters more accessible (Melia et al., 2016; Smith and Stephenson, 2013; Zhao et al., 2025). While this increased access creates opportunities for trade, economic development, and regional connectivity, it also introduces significant risks to marine and coastal ecosystems, Inuit food security, cultural continuity, as well as complex sovereignty and geopolitical challenges (Huntington et al., 2023; van Luijk et al., 2021). Furthermore, shipping remains essential to Arctic communities, supporting mobility, providing critical resupply, and economic activity.

Given its central role and wide-ranging impacts, there is a critical need for coordinated, long-term research to better understand and manage these changes. However, current research on Arctic shipping is often fragmented, short-term, and discipline specific. As multi-year projects conclude, the relationships built between partners, particularly Inuit organizations and communities, can weaken, leaving important questions unanswered and limiting long-term, coordinated progress.

The Sustainable Arctic Shipping Knowledge Exchange (SASKE) Community of Practice (CoP) was established to address this gap by creating a sustained, cross-disciplinary forum that supports ongoing collaboration among researchers, Inuit organizations, Arctic communities, industry representatives, and policymakers.

Funded through the MEOPAR CoP program, the SASKE CoP was founded by researchers at the University of Ottawa in Fall 2025, but builds on a much longer history of collaborative, community-engaged Arctic research. This includes longstanding partnerships and approaches developed over decades of work alongside Inuit organizations, communities, and federal partners. More recently, collaborations with Environment and Climate Change Canada (ECCC), Ikaarvik, and other partners through the Inuit Qaujisarnirmut Pilirijjutit on Arctic Shipping Risks (IQP-ASR) project (https://www.arcticshippingscience.com/) helped to further strengthen these relationships and highlight the need for a sustained, cross-cutting forum. The IQP-ASR project, which examined shipping impacts and risks across Inuit Nunangat, demonstrated both the value of this approach and the gaps that remain when efforts are time-limited (Dawson et al., 2025).

Building on this foundation, the SASKE CoP expands engagement even further, to include additional Inuit Knowledge holders, western-trained scientists, industry partners, youth and

other stakeholders in this forum to support dialogue and collaboration on advancing sustainable Arctic shipping, including the co-development of knowledge, priorities, and pathways that reflect ecological integrity, cultural continuity, community well-being, and responsible governance.

To initiate these discussions and connect with the broader Arctic research community, a SASKE workshop was convened at the 2025 ArcticNet Annual Scientific Meeting in Calgary, Alberta.

SASKE Leadership
Dr. Jean Holloway, Lead
Dr. Bonnie Hamilton, Co-Lead
Dr. Jackie Dawson, Co-Lead
Julia Macpherson, Coordinator

What is our current state of knowledge related to shipping?

The number of ships operating in the Canadian Arctic has more than tripled between 1990-2022 (Figure 1), with the most rapid growth occurring in the past two decades. This trend has been driven by a combination of factors, including increasing community resupply needs, tourism, and resource extraction projects, alongside climate-driven reductions in sea ice that have expanded seasonal access to Arctic waters (Dawson et al., 2018; Pizzolato et al., 2016). As the climate continues to warm, further declines in sea ice are expected to sustain or accelerate this growth in shipping activity. However, these changes do not necessarily translate to safer or more predictable conditions. In the northernmost Canadian Arctic Archipelago (CAA), sea ice is projected to remain in what is called the Last Ice Area, but become more mobile and variable from year to year, increasing uncertainty and operational challenges for vessels (Dawson et al., 2022).

A substantial body of research now highlights that Arctic shipping presents a complex set of sustainability trade-offs. On one hand, shipping is essential to Arctic communities, enabling the delivery of essential food, fuel, and goods, supporting economic development, and facilitating mobility and connectivity across remote regions. On the other hand, increased vessel activity introduces a wide range of socio-cultural and environmental pressures, many of which disproportionately affect coastal and Indigenous communities. These include disturbances to marine mammals and seabirds that underpin Inuit food systems, disruption of sea ice travel routes, safety risks from vessel wakes and icebreaking, and impacts to cultural sites and community well-being.

Environmental impacts are similarly wide-ranging and occur across multiple temporal scales. Chronic effects include air emissions (e.g., black carbon, NOx, SO_2), underwater noise, and routine vessel discharges, all of which contribute to ecosystem change and human health risks. Acute risks, such as oil or fuel spills, remain a major concern given the limited spill response capacity in remote regions. Shipping also contributes to marine litter and the introduction of non-Indigenous species, further stressing already vulnerable Arctic ecosystems. These impacts are not evenly distributed, but vary by region, season, vessel type, and proximity to communities and ecologically sensitive areas.

Importantly, research increasingly emphasizes that Arctic shipping is not only an environmental or economic issue, but a governance challenge. Existing international and national regulatory frameworks, such as the Polar Code, provide important safety and environmental protections but remain largely technical and vessel-focused, often overlooking socio-cultural dimensions and leaving gaps in coverage for smaller vessels and local traffic. In response, a diverse and evolving set of governance approaches has emerged across the Arctic, including Indigenous-led stewardship and monitoring programs, community-based data collection, marine spatial planning initiatives, low-impact shipping corridors, and voluntary industry practices. Together, these efforts reflect a shift toward more integrated, multi-level, and community-informed approaches to managing Arctic shipping.

Overall, the current state of knowledge highlights that Arctic shipping is increasing in scale and complexity, shaped by interacting environmental, economic, and social drivers. While significant progress has been made in understanding its impacts and developing responses, important gaps remain, particularly in coordinating efforts across regions and scales, and in supporting long-term, relationship-based approaches to sustainable shipping.

Workshop Objectives

The SASKE workshop served to introduce the CoP and begin shaping Year 1 priorities. The workshop was designed to bring together diverse participants from multiple regions and sectors to discuss key shipping-related impacts and opportunities as well as to identify knowledge and governance gaps and to collaboratively define how SASKE should function as a CoP. Specific workshop objectives included:

1. Introducing SASKE – its purpose, vision, and proposed structure as a CoP;

2. Facilitate in-depth, topic-specific conversations on major Arctic shipping impacts and opportunities using maps and simple data visualizations;
3. Identify cross-cutting concerns, needs and knowledge gaps across regions and sectors;
4. Gather input on SASKE's ongoing activities and roles (e.g. workshops, webinars, data sharing, newsletters, working groups); and,
5. Establish SASKE's initial priorities for Year 1 through a structured synthesis and voting process.

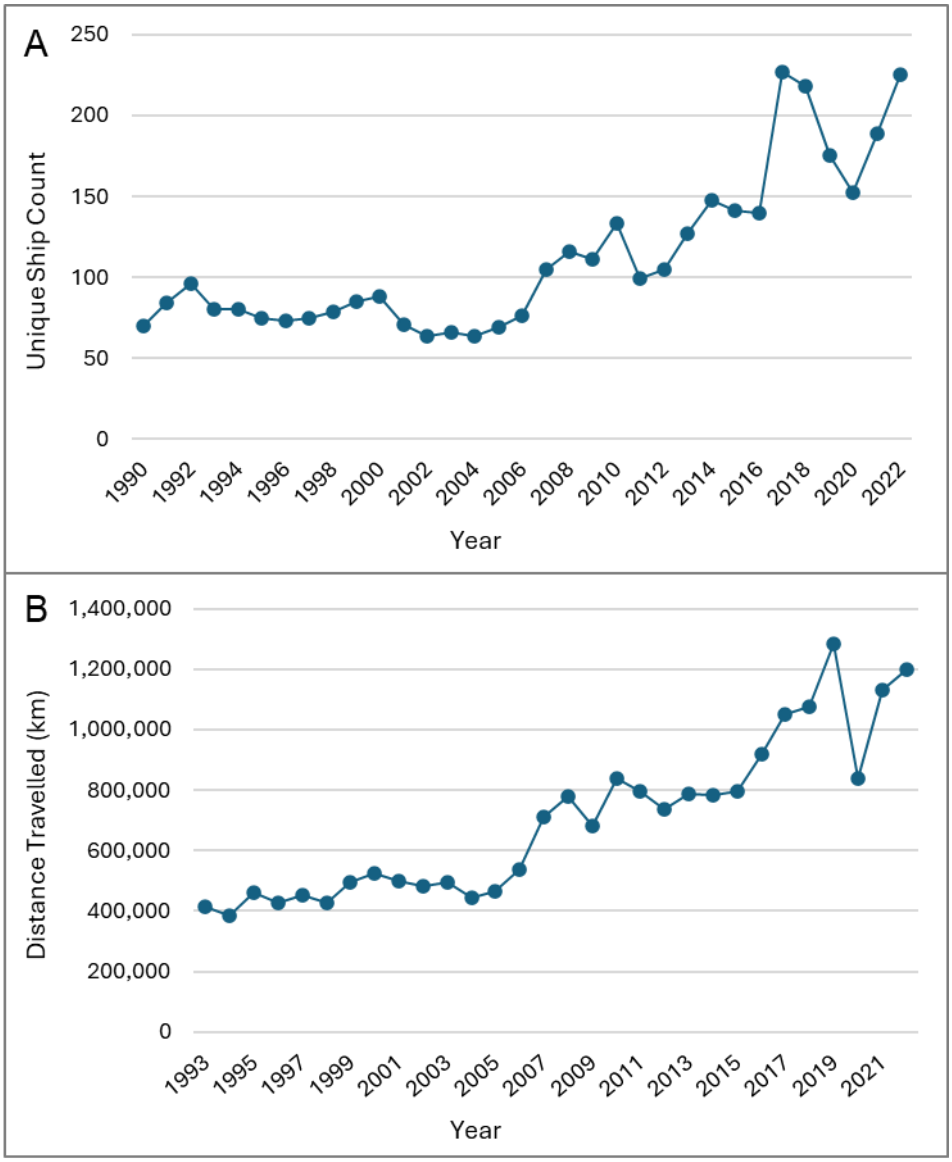

Figure 1. Unique ships (A) and distance travelled by ships (B). Note that in B, the x-axis begins in 1993 due to lack of reliable data for distance travelled during the years 1990-1992 (Dawson et al. 2024).

Workshop Results

The hybrid workshop brought together 25 participants (9 virtual and 16 in-person) from academia, government, Indigenous organizations, non-profit organizations, and the industry sector.

Figure 2. Attendees of the 2025 SASKE workshop at ArcticNet.

Shipping trends & hotspots

SASKE Lead Jean Holloway delivered an overview of current research on the risks and opportunities associated with increased shipping in the Arctic.

The presentation emphasized that while climate-driven reductions in sea ice are increasing access to Arctic waters, these changes are not necessarily reducing navigational risk. A thinner, younger ice pack is more mobile and variable, contributing to increased uncertainty from year to year, particularly along routes such as the Northwest Passage. As a result, changing ice regimes may, in some cases, introduce new operational challenges rather than simplify navigation.

Particular attention was given to “choke points”, locations where sea ice builds up in narrow or shallow channels, impeding travel along routes that are otherwise largely ice free. These

areas represent key zones where risk is concentrated and where increased traffic may have disproportionate impacts.

The presentation also highlighted the rapid growth in shipping activity in the Canadian Arctic since the mid-2000s, including a notable increase in vessels with limited or no ice strengthening. This trend raises important safety and governance considerations, particularly in regions experiencing both high traffic volumes and ecological sensitivity, such as Frobisher Bay, Lancaster Sound, and Franklin Strait.

Finally, the presentation underscored that increased access to Arctic waters presents both risks and opportunities. Expanded resupply windows may improve access to goods and support economic development in some communities. However, these benefits are uneven and highly location-specific, reinforcing the need for regionally grounded and community-informed approaches to managing Arctic shipping.

Ship-sourced pollution

Additional information on ship-sourced pollutants in the Arctic environment was presented by SASKE Co-Lead Bonnie Hamilton, drawing on recent research examining contaminant pathways and environmental exposure.

The presentation highlighted that increasing ship traffic across Inuit Nunangat is accompanied by a corresponding rise in the risk of pollution to marine and coastal environments. Ships act as mobile, point sources of contaminants, releasing a range of substances including antifouling compounds, polycyclic aromatic compounds (PACs), exhaust-derived particles, wastewater, and operational discharges such as stern oil (Figure 3). These pollutants can enter Arctic ecosystems through multiple pathways and pose risks to both environmental health and communities that rely on marine resources.

A key emphasis was placed on the complexity of contaminant transport and fate in Arctic systems. Understanding how pollutants move through and accumulate in the environment requires multi-matrix sampling approaches that consider water, sediment, and biological tissues. This type of integrated monitoring is critical for identifying sources of contamination and assessing how pollutants are transferred through food webs and into harvesting areas.
Preliminary findings from recent research in the Eastern Arctic indicate a high abundance of vessel-derived microplastics, particularly in the form of paint particles, in both water and sediment samples. Early results suggest that concentrations of these materials may be

linked to patterns of vessel traffic, pointing to shipping as a significant and under-recognized source of microplastic pollution in Arctic marine environments.

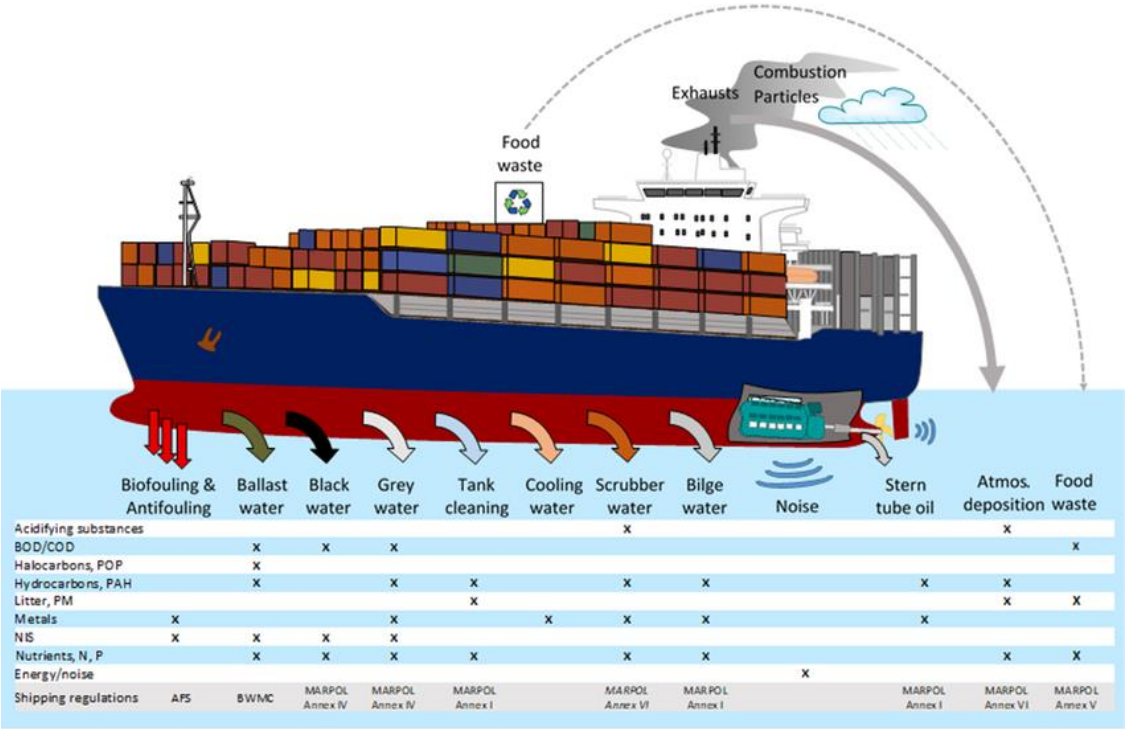

Figure 3. Figure from Jalkanen et al., (2021) demonstrating waste streams from ships into the marine environment.

Breakout group activity

Following the introductory presentations, participants engaged in a rotating breakout activity designed to explore key themes in greater depth. Small groups moved between four discussion stations, each focused on a specific question:

1. What is happening in different regions/sectors;
2. Core impacts and opportunities;
3. Key knowledge or data gaps; and,
4. What SASKE could do to support this area in the next 12 months.

At each station, participants contributed observations, experiences, and ideas using sticky notes, maps, and visual prompts. This format enabled iterative discussion, allowing groups to build on previous contributions and identify areas of convergence and divergence across perspectives.

Ongoing Research and Monitoring Activities

Workshop participants identified a range of ongoing research and monitoring activities across academic, government, and partner organizations. These efforts span environmental monitoring, shipping risk assessment, and community-focused research. The examples below reflect contributions shared during the workshop and are not intended to be comprehensive.

- University of Ottawa
    - Long-term shipping trends and geospatial data analysis
    - Database of ship characteristics
    - Sea ice and weather-related hazards and risk
    - Climate modelling and projections of sea ice
    - Sources, fate, and impacts of ship-based contaminants across Inuit Nunangat
    - Maritime supply chains and community resupply
    - Ecosystem-level impact of orcas in Pond Inlet
- Fisheries and Oceans Canada (DFO)
    - Narwhal stock assessments in Pond Inlet
- Environment and Climate Change Canada (ECCC)
    - Microplastics in the environment
    - Animal interactions with plastics
    - Ecosystem-level impacts of plastics
    - Ship-based contaminant assessment and monitoring
- Nunavut Tunngavik Inc.
    - AIS vessel monitoring

Key knowledge or data gaps

The following knowledge gaps reflect discussions from workshop participants and are not intended to be comprehensive. Rather, they represent key themes identified across sectors and regions, which will continue to be refined through SASKE activities. Key themes are grouped below for clarity.

Contaminants & invasives

Key points:

- Conversations related to contaminants and invasives are lacking at the community-level and require clear, understandable forms of communication;
- Dive training to monitor the sea floor in communities;
- Clear distinctions between “invasive”, “introduced” and “non-native” are needed.
- Data sharing and accessibility are lacking, particularly for shipping data;

- Need to assess and monitor contaminants in Western Hudson's Bay, specifically in Baker Lake, Chesterfield Inlet, and Rankin Inlet; and,
- Need eDNA monitoring for aquatic invasives to create baseline information to inform future work.

Shipping

Key points:

- Lack of information related to refuelling ships and their behaviour;
- Actionable options for Inuit governance of shipping;
- How shipping and other climate change factors affect animals and Inuit use of the seascape;
- How to adequately communicate risks associated with shipping activities as the variability of conditions increases;
- Localized impacts of vessel activity near communities (e.g., ships idling or staging for refueling), which are distinct from transit shipping activities; and,
- Spill detection in ice covered waters and ownership of response.

Data accessibility and other knowledge gaps

Participants emphasized that challenges related to data accessibility, coordination, and communication remain significant barriers to effective research and decision-making.

Key points:

- Challenges related to timing and communication, especially with Northern organizations;
- There is much data on the Eastern Arctic but little on the Western Arctic;
- Need monitoring (AIS, hydrophones) on western entrance to the NWP;
- Interconnected community and research interests;
- Cross-disciplinary and inter-agency collaboration;
- Need to enhance community level response capabilities, equipment and training;
- Some issues discussed are not always immediately visible without scientific context. This highlights the importance of researchers clearly communicating these topics and doing the necessary groundwork, rather than expecting communities to independently identify or prioritize topics. Participants also noted that priorities are often similar across communities within a region, reinforcing the need for regionally informed approaches rather than treating communities as having entirely distinct priorities; and,

- Need for impact and benefit agreements to be established prior to industrial development, ensuring that community priorities and benefits are clearly defined from the outset.

Figure 4. Summary of breakout group activity identifying data gaps and ongoing work related to shipping in Inuit Nunangat.

Areas where SASKE could support

Key points:

- Frequent meetings
- In-person connection opportunities
- Annual workshops
- Prioritizing communication to communities
- Shareable social media outreach

Synthesis and Conclusion

Across breakout stations, several consistent themes emerged. Participants highlighted the need for improved coordination, communication, and accessibility of information, particularly in ways that are meaningful and usable at the community level. This included a

clear need for more accessible communication around contaminants and invasive species, as well as improved sharing of shipping-related data.

There was also strong recognition of uneven knowledge and monitoring capacity across regions, with notable gaps in the Western Arctic and in areas related to contaminants, vessel behaviour, and spill response. More broadly, discussions underscored the growing complexity of Arctic shipping, including cumulative impacts, increasing environmental uncertainty, and the need for governance approaches that better reflect Inuit priorities and knowledge systems.

Collectively, these insights highlight the need for more integrated and community-informed approaches to Arctic shipping research and governance. They also reinforce the value of sustained, relationship-based platforms such as SASKE in supporting knowledge exchange, identifying shared priorities, and advancing collaborative action.

While significant research and monitoring efforts are already underway, discussions highlighted that these activities often remain fragmented across regions, sectors, and disciplines. A key gap identified is not only in data itself, but in the coordination, communication, and accessibility of that knowledge.

SASKE is uniquely positioned to address this challenge by serving as a sustained platform for dialogue and connection across these efforts. Rather than duplicating existing work, the CoP provides a space to align activities, share insights, and identify shared priorities across Inuit Nunangat. In doing so, SASKE helps translate fragmented efforts into more coordinated, efficient, and community-informed approaches to Arctic shipping research and governance.

Next steps

Building on these priorities, SASKE will focus on strengthening ongoing engagement, coordination, and knowledge sharing across sectors and regions. Continuing the momentum of the 2025 workshop, initial priorities for Year 1 will focus on strengthening connections within the CoP and advancing accessible communication and outreach.

Planned activities include the publication of this workshop report, the development of outreach and engagement strategies, and the continuation of regular meetings to maintain dialogue among members. Short-term actions will also include the creation of accessible communication materials (e.g., social media content) and the organization of follow-up workshops.

These early steps are intended to support continued collaboration, address identified knowledge gaps, and lay the foundation for longer-term, coordinated efforts toward sustainable Arctic shipping.

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