Highlights of

Canadian Marine Shipping Risk Forum

WORKSHOP ON CREATING AN INVENTORY OF
MARINE SHIPPING RISK RESOURCES

"Building a strong community of practice, identifying existing tools and best
practices, is a critical step in making sure that Canada has strong and consistent
risk management in the area of marine shipping."

Michael Wallace, Transport Canada, December 3, 2020

ABOUT THIS REPORT

This report summarizes highlights of the online workshop, "Creating an Inventory of Marine Shipping Risk Resources" convened by the Canadian Marine Shipping Risk Forum (CMSRF) on December 3, 2020. The workshop aimed to engage a broad community of practitioners in shipping research and application. The CMSRF is a MEOPAR-funded Community of Practice providing an ongoing forum for communicating about and identifying potential collaborations on shipping risk in Canada.

The goal of this workshop was to explore the concepts of an inventory and framework of shipping risk in Canada, in a collaborative workshop format that brought together representatives of government agencies, Indigenous groups, researchers, industry and other relevant organizations from across Canada whose work focuses on maritime shipping.

The workshop offered participants the opportunity to hear from leading experts about shipping risk initiatives undertaken by academic researchers (MEOPAR), Transport Canada and Clear Seas. The presentations were followed by interactive and collaborative breakout group discussions, through which participants could share their knowledge, contribute relevant resources and initiatives for inclusion in the inventory, and provide other input and suggestions for advancing the risk inventory and framework.

The interest in these topics was demonstrated by the engaged participation of over 90 registrants from academia, industry, government, and non-governmental organizations from across Canada.

TABLE OF CONTENTS

WORKSHOP OVERVIEW

MEOPAR, Clear Seas and exactEarth hosted an interactive online workshop on December 3, 2020 on *Creating an Inventory of Marine Shipping Risk Resources*. This workshop was part of a planned series of workshops and webinars to explore related topics in shipping risk and provide a recurring forum for knowledge exchange.

In the fall of 2019, the need for a risk inventory and framework was identified as a topic of interest by members of the CMSRF Steering Committee. As shipping risk management encompasses many groups, initiatives and issues, there is a need to harmonize efforts, catalog and share resources, and identify and fill gaps. A risk inventory and framework were identified as potentials tool for risk practitioners to understand and leverage existing work and methodologies, to better support the management of shipping risk in Canada.

This workshop started the development of a comprehensive inventory and framework for shipping risk management in Canada, through a facilitated brainstorming session with participants who could provide input on both what to include and the expected users of the tool. The purpose of this workshop was to introduce the inventory and framework concepts, illustrate examples of potential content and structure, and provide opportunities for sharing amongst participants. Additional workshop outcomes included increased connections, knowledge sharing and communication among participants.

CMSRF Steering Committee members demonstrated current examples of shipping risk initiatives for an inventory, provided examples of risk management concepts and a framework (*ISO 31000 Risk Management – Guidelines*) and other ongoing risk inventory initiatives and toolkits (EPPR Guideline, Hazard Toolkit, IALA Toolbox, and OpenRisk Guideline) that could serve as a starting basis for a risk inventory and framework structure.

Breakout group discussions gathered input from the CMSRF's broader membership to start to identify what could be included in the inventory, how it could be organized, and who could be involved – as well as to help scope a process for how to develop an inventory and framework that serves the breadth of needs of different users.

General support for developing a common risk inventory and framework was heard amongst the breakout group discussions. The need for common terminology and definitions, incorporation of a variety of expertise and perspectives, including traditional and local knowledge, risk communication and risk perception, were common themes raised in discussions. Input from the workshop and breakout group discussions was collated by the Community of Practice to help advance the development of an inventory and framework for shipping risk in Canada.

ABOUT THE CMSRF COMMUNITY OF PRACTICE

This Community of Practice was formed in response to an identified need in Canada for an on-going forum to discuss developments in marine shipping modelling and risk assessment. The MEOPAR Research Network, in collaboration with the Clear Seas Centre for Responsible Marine Shipping and exactEarth Ltd, launched this Community of Practice to be open to, and supportive of, people and organizations working and doing research in these fields, and to network and share knowledge on these topics.

This Community of Practice – focused on modelling and risk assessment for marine shipping – is one of eight such communities supported by MEOPAR to:

- Help to mobilize knowledge, enrich research and identify knowledge gaps, and encourage collaboration between academics, practitioners, policy-makers and community groups.
- Provide a way for practitioners to share best practices, ask questions of their colleagues, and provide support for each other.

The Canadian Marine Shipping Risk Forum Community of Practice will focus on the exploration of risks from – and to – shipping within Canadian waters, with three primary interest areas:

- Shipping movement data
- Shipping traffic modelling
- Shipping risk quantification and assessment

The anticipated outcomes of this Community of Practice and its activities include:

- Identifying best practices for shipping modelling and shipping risk analysis
- Maintaining active discussion on new developments in marine shipping data sources
- Identifying gaps in marine shipping risk assessment and sharing knowledge to address them
- Engaging with stakeholders and highly qualified personnel to develop further knowledge on approaches for considering shipping risk as well as techniques on shipping data handling through the inclusion of training components within each of the year 2 and 3 workshops.

Ultimately, this Community of Practice will provide a focal event for identifying, discussing and furthering application of best practices for shipping modelling and shipping risk analysis, topics inherently interdisciplinary in nature.

WORKSHOP HIGHLIGHTS

Workshop Approach

Workshop attendees were solicited through the CMSRF Community of Practice network, with the aim of gathering a diverse group of participants who could both provide input on what could be included in the tool and provide representative perspectives for the intended users of the tool.

The workshop and intended outcomes are part of a larger body of work intended to help identify and address gaps in shipping risk knowledge and risk communication by:

- Looking at Canadian initiatives and information resources relating to shipping risk,

- Outlining a common risk framework for marine shipping, and

- Mapping initiatives and resources to a risk framework.

Presentations

The workshop provided a series of presentations by members of the Community of Practice Steering Committee to introduce the inventory and framework topics and concepts. The presentations were followed by a Q&A period with the four presenters.

1) Origins of the CMSRF and Clear Seas' Research in Maritime Risk

Speaker	Paul Blomerus, Clear Seas Centre for Responsible Marine Shipping
Materials	[Video](#)	[Presentation](#)
Highlights	Provided context on the CMSRF and the need for the inventory and framework workshop and shared some of the perspectives gained through Clear Seas' research in maritime risk and applications. Industry feedback is that there are many different activities by many different groups that both overlap and differ in objective and approach, which creates the potential for duplication and confusion. Amongst the general public, roughly half of respondents to a 2020 opinion poll feel not enough is being done both in terms of safety policy and procedures and also for the oversight of existing policies. There is a need for a coordinated, unified and transparent process to create a shared approach to assessment and management of risk.

2) Oceans Protection Plan Update

Speaker   Michael Wallace, Transport Canada

Materials   [Video](#) | [Presentation](#)

Highlights   Outlined a number of different actions and tools that Transport Canada is taking and applying for the assessment, identification, and mitigation of shipping risk, specific to key initiatives under the Oceans Protection Plan including: Proactive Vessel Management, Cumulative Effects of Marine Shipping, Emergency Towing Initiative, TERMPOL and Enhanced Maritime Situational Awareness, as well as a demo of GIS-based tools using AIS data. Highlighted the amount of work already happening in this space, noting several linkages between the different projects introduced by Clear Seas in the first presentation. Focus going forward is to build tools and processes to help bring consistency to the assessment and mitigation of risk, as well as alignment between the different frameworks in place, to provide more certainty to coastal communities and the shipping industry for how the key questions pertaining to risk are addressed. Building a strong community of practice, identifying existing tools and best practices is an important step in strong and consistent shipping risk management.

3) Examples of Shipping Risk Research in Canadian Universities

Speaker   Ronald Pelot, MEOPAR and Dalhousie University

Materials   [Video](#) | [Presentation](#)

Highlights   Introduced MEOPAR's mandate to better understand and research marine risks including risks associated with shipping, within the framework of risks *to ships* and risks *from ships* with topics related to shipping patterns, risks of shipping, impacts of shipping on the environment. Aimed to demonstrate the kind of work done by MEOPAR and the broader academic research community that could be included in a shipping risk inventory (alongside the example initiatives by Clear Seas and Transport Canada in the first two presentations) to inform the breakout group discussions. Key questions to think about are commonalities across the initiatives, and what structure and key words could be used to inventory these different kinds of projects, with the objective to use similar terminology and practices to catalogue different initiatives and issues related to shipping risk.

4) Maritime Risk Management Frameworks and Toolboxes

Speaker   Floris Goerlandt, Dalhousie University

Materials   [Video](#) | [Presentation](#)

Highlights   Introduced maritime risk management concepts to frame discussions in the breakout groups. Provided examples of an existing risk management framework (*[ISO 31000 Risk Management – Guidelines](#)*) and maritime risk guidelines and toolkits for maritime authorities and industries, drawing from the areas of pollution preparedness and response and port risk management as examples (EPPR Guideline, Hazard Toolkit, IALA Toolbox, and OpenRisk Guideline) that could serve as a starting basis for a risk inventory and framework structure.

5) Question & Answer Period

Speaker   Panelists

Materials   [Video](#)

Highlights   Presenters responded to questions from participants on the topics of AIS, MEOPAR reports, the Arctic Shipping Assessment materials, radar installation on BC coast for ground-truthing AIS data, timing of marine shipping public opinion survey, perspectives of insurers on maritime risk.

Summary of Breakout Group Sessions

The workshop included breakout discussions amongst participants. The breakout groups were guided by a series of questions intended to gather knowledge and identify gaps for future research on that topic area. Each room was assigned a facilitator and a scribe, who were provided with templates to take notes and to list information resources or initiatives mentioned by breakout room participants; audio and video of the breakout room discussions were not recorded.

The breakout group discussion questions included:
1. What are the tools and resources that would be useful for marine shipping risk practitioners to include in the inventory? Suggestions could be related to:
   a. Current risk management initiatives
   b. Key best practices related to risk management
   c. Types of data and known datasets
   d. Other
2. What suggestions do you have for how the inventory could look and work?
3. How can the CMSRF reach others about this initiative?

Notes from the breakout group discussions are organized into six themes, as follows. Specific suggestions for existing tools, initiatives and resources identified during the breakout groups for inclusion in the inventory are provided in **Appendix D**

1) **Support for the inventory and framework and its utility for risk practitioners**
   - An **inventory would be valuable** to many; a **community of practice approach** helps break down silos and encourage collaboration which is needed.
   - Provide for a standard approach that incorporates **recognition of change** – changing conditions, changing best practices – into risk assessment frameworks and re-evaluate past assessments.
   - **Standardize data collection** for better risk assessments. Lack of data sharing leads to **duplication of effort**; collecting data in a common location makes it accessible to **drive improvement and innovation**.
   - Increase **accessibility and sharing** of tools, across and between agencies.
   - **Risk communication**, and communication in general, is vitally important. Risk communication and risk perception an important question to explore. Useful tools would be a public forum (transparency) for clear communication on how risk is managed over time.

2) **Strategic considerations: process for building an inventory and framework**
   - Carefully **define scope** of inventory (geographic and topical):
     - o Clarify geographic scope – don't duplicate existing forums.
     - o Cross-boundary – provincial/territorial boundaries, as well as USA/Canada.
   - **Clarify goals, participants, and methods** – be strategic, not ad hoc. Who are the users?
   - **Integrate this initiative with others** – e.g., the Transportation 2030 Data Hub initiative.
   - Consider the best way to **structure and categorize** these datasets/initiatives for **ease of use/utility**. There are huge amounts of data; clear communication allows for efficient use and where it is most useful/needed.
   - Consider issues related to **data sharing and data access** - difficult to share within and across sectors.
   - *Collaborative effort* that draws on the network of different people from different backgrounds. "No one group or person is sitting on the solution."

3) **Users and perspectives to consult for input are various**
   - Incorporate **expertise and local knowledge** of practitioners – for example ice-pilots and other mariners or industry practitioners – and invite early in process
   - Need input from shipping industry and ship owners; people with on-water experience – to provide the perspective of the people in the field who are directly affected and who have the practical experience.
   - Consideration on *how to* **invite input from practitioners and industry** – the suggestion was offered to make a list of topics and invite them to participate in those they are interested in (i.e. attend conferences).

- o Engaging international ship owners is difficult - may be less interested in in local jurisdictional efforts
  - o Engage ship operators and owners, and pilots / pilotage authorities
- Reach out to **shipping industry** and ship owners, including to understand what data are collected by shipping companies? Specifically, it was flagged that input is needed from the **Shipping Federation**.
- Incorporate and invite **traditional and Indigenous knowledge** holders – and invite early in process.

4) **Content themes: types of inputs for the inventory to include**
- Incorporate **biological, social, economic**, data as well as **Indigenous and Traditional Knowledge**.
- Include real-time continuous data; ship registry data.
- The types of ships, and their density. Marine traffic simulation models for ship movements and ship dynamics (**invite modellers**).
- Draw from the pilotage marine databases, navigation in confined waters and in ice-infested waters or the Gulf.
- Need tools for **ice-navigators/pilots**.
- Consider sources of information beyond **AIS, as it's not "full picture"** - small vessels are not included, for example.
- **Look to the future** and consider risk assessments when changes happen, e.g.: Artificial Intelligence (AI), pilotage in remote areas; changing conditions; Arctic shipping; oil spill assessment; larger ships (more fuel); changes in traffic and traffic regulations.
- Consider cumulative impacts, including the social and economic impacts of shipping and the interactions between these factors.
- Consider environmental response (noting lots of useful data with the Coast Guard).
- Characteristics of crude oil is changing, updated research and information is needed.
- Mitigation risk (e.g., in the Gulf of St. Lawrence vessels don't have double holds).
- Auditor General of Canada review cycles (oil spill response regime) and acknowledgement of the role this type of oversight plays in identifying gaps in capacity and the availability of resources.
- Current **gaps** include lack of data for small vessels, transport of hazardous and noxious substances (HNS).

5) **Operational considerations: how the inventory could look and work**
- Multi-sector, collaborative.
- Make it publicly available; a central repository, available to all
- Prefer a web-based inventory, organized by topics; reports available for download (not paywalled); searchable with key words/categories
- Risk communication - develop common terminology - public forum
- IMO is a key player to bring in.
- Integrate with other initiatives.

- An important question for consideration at the conceptual and building phase is **who will manage and maintain the inventory**?

6) **Going forward: how the CMSRF can reach others about this initiative**
   - Email list
   - Shipping forum website
   - Online links: Transport Canada website, Oceans Protection Plan (OPP) website
   - Government of Canada as a host to the inventory or other workshops related to the project – this has the potential benefit of providing more trust and credibility.
   - Through citizen science (e.g., "crowdsourced" data input to the inventory)
   - Knowledge mobilization – publish in open access journals or reports that are publicly available

Next Steps for CMSRF Community of Practice

The risk inventory and framework workshop provided a valuable opportunity to hear from a diverse group of risk practitioners on the concept of developing a comprehensive inventory and framework for shipping risk management in Canada. Input from the workshop and breakout group discussions will be collated by the CMSRF Steering Committee for consideration in how the Community of Practice can help advance the topic. The Community of Practice intends to continue the discussion through additional workshops and webinar presentations on relevant topics by a wide range of people and organizations involved in understanding and addressing shipping risk.

APPENDIX A – WORKSHOP PROGRAM

CANADIAN MARINE SHIPPING RISK FORUM
Workshop: Creating an Inventory of Marine Shipping Risk Resources
Wednesday, December 3, 2020
at 9:30am PT / 12:30pm ET / 1:30pm AT / 2:00pm NL (2 hours)

Time (PT/ET/AT)	Topic / Activity	Participant
9:25/12:25/13:25	Attendees welcome to join by clicking the Zoom Meeting link	Attendees
9:30/12:30/13:30	Welcome, workshop objectives and goals	Jennifer Steele, Clear Seas
9:33/12:33/13:33	CMSRF objectives and examples of risk research at Clear Seas	Paul Blomerus, Clear Seas
9:44/12:44/13:44	The Oceans Protection Plan and managing shipping risk	Michael Wallace, Transport Canada
9:55/12:55/13:55	Examples of shipping risk research in Canadian Universities	Ron Pelot, MEOPAR
10:06/13:06/14:06	Risk frameworks: examples and relevance for marine shipping	Floris Goerlandt, Dalhousie University
Breakout Rooms – Small Group Discussions on Frameworks and Resources for Maritime Risk		
10:20/13:20/14:20	Attendees form small groups for breakout room discussions with a scribe and discussion facilitator in every breakout room.	Everyone
11:10/14:10/15:10	Return to the 'main room' (full group) for final thoughts on the workshop from presenters and participants.	Everyone
11:25/14:25/15:25	Workshop conclusion and next steps	Jennifer Steele, Clear Seas

APPENDIX B – SPEAKER BIOS

Speaker biographies are presented in the order of the workshop program

Jennifer Steele, Clear Seas Centre for Responsible Marine Shipping

Jennifer is the Manager of Research & Knowledge Mobilization of Clear Seas Centre for Responsible Marine Shipping. She is an experienced environmental and sustainability planner with a multi-disciplinary career experience in the public and private sectors. After obtaining a B.Sc. in Chemistry from the University of British Columbia, Jennifer started her career as a research scientist in Vancouver's biotech industry. From there, her passion for the outdoors and our oceans in particular led her to complete a Master of Marine Management at Dalhousie University. In her work as an environmental consultant, Jennifer has provided strategic planning and facilitation support to collaborative multi-stakeholder processes balancing environmental, economic, social and cultural values. Jennifer has been involved in projects relating to port infrastructure development, coastal contaminated site remediation and marine risk assessments. She has also worked for DFO's Ocean's Program on Marine Protected Area planning in the Pacific Region.

Paul Blomerus, Clear Seas Centre for Responsible Marine Shipping

Paul Blomerus is Executive Director of Clear Seas Centre for Responsible Marine Shipping. He is an internationally experienced researcher and leader in innovation with experience in industry as well as university research management. As Senior Advisor, Research and Industry Partnerships with the University of British Columbia (UBC), he developed two successful research clusters focused on clean energy and marine systems. Dr. Blomerus also built up a successful independent consulting practice specializing in clean energy and policy deployment helping government agencies understand the impact of technology on the transportation sector. He is a published author on a range of marine shipping and transportation issues. His industry experience includes leadership roles in supply chain, intellectual property and customer relationship management for Rolls-Royce Aerospace. Dr. Blomerus holds a PhD in Engineering Science from the University of Oxford and a Mechanical Engineering degree from the University of Cape Town.

Michael Wallace, Transport Canada

Michael is a native of Ottawa, Ontario, where he currently works as a policy analyst for Transport Canada. He has worked at Transport Canada since 2009, primarily on files related to marine safety and environmental protection. He has also worked on a number of risk assessment projects while with Transport Canada including the Pan-Canadian Risk Assessment that was completed to support the world-class tanker safety system initiative and the Area Risk Assessment project from 2014 to 2017. Michael currently works on implementing a number of initiatives supporting Canada's Oceans Protection Plan.

Ron Pelot, MEOPAR and Dalhousie University

Ronald Pelot is a Professor in the Department of Industrial Engineering at Dalhousie University and the Associate Scientific Director of the MEOPAR (Marine Environmental Observation, Prediction and Response) Network of Centres of Excellence, headquartered at Dalhousie. He co-leads the Maritime Risk And Safety Research group (MARS) at Dal (formerly MARIN, founded in 1997). Over the past three decades, he and his team have developed new software tools and analysis methods applied to maritime traffic safety (accidents), coastal zone security, and marine spills. Research methods encompass spatial risk analysis, vessel traffic modelling, data processing and pattern analysis, location models for response resource allocation, safety analyses, and cumulative shipping impacts studies. Dr. Pelot has published over 50 journal articles and produced more than 100 technical reports.

Floris Goerlandt, Dalhousie University

Floris Goerlandt is an assistant professor at the Department of Industrial Engineering at Dalhousie University. He is also the Canada Research Chair in Risk Management and Resource Optimization for Marine Industries. He obtained an MSc degree in Maritime Sciences from the University of Antwerp (Antwerp, Belgium) in 2006, an MSc degree in Marine Technology from Ghent University (Ghent, Belgium) in 2005, and a PhD degree in Maritime Risk and Safety in 2015 from Aalto University (Espoo, Finland). He additionally has industrial experience with safety services in the maritime industry and regulatory experience at the Baltic Marine Environment Protection Commission (HELCOM), where he contributed to developing a guideline for oil spill pollution preparedness and response risk management for European response authorities. His expertise is in risk analysis and management, safety engineering and management, maritime transportation, modelling and optimization of transportation systems, and emergency/disaster planning and response. He has published about 60 co-authored journal articles, 40 conference papers, numerous reports, and recently co-edited book on Arctic shipping. He is editorial board member of Safety Science and received the 2020 Dalhousie University President's Research Excellence Awards for Emerging Investigators in recognition of his achievements.

APPENDIX C – WORKSHOP PARTICIPANTS

Of 114 advance registrants, 96 people attended the workshop. This number excludes the workshop moderator and speakers, scribes, and the Zoom host and chat monitor (an additional 12 people). Half of the attendees (48) remained for the breakout sessions. The majority of the registrants (73) were non-subscribers to the CMSRF membership list with 54 non-subscribers attending. Only 37 of 102 (36%) communications list subscribers registered, with 25 of 102 (25%) subscribers attending the workshop. Eleven (11) attendees were unidentified (e.g., could not be matched with the registration list or subscriber list).

Attendees' names, organizations and organization type are provided in Table 1. This attendance summary was compiled from three information sources: the CMSRF subscribers list (people who signed up to receive notifications from CMSRF); the registration tracking list (used to track registrations and communication and which reflects the Eventbrite registration reports and manual registrations [people who emailed the organizers directly or who replied to Steering Committee member calendar invitations that were shared]); and the Zoom Meeting attendee report. This record is based on details provided during registration, reconciled against the scribes' list of participants in the breakout group session and from a screenshots from the Zoom room list.

Table 1: Breakout Room Membership

Room	Count	Name	Affiliation	Sector
1	A	**Facilitator - Paul Blomerus**	Clear Seas	NGO
1	B	**Scribe - Chloe Scott**	Clear Seas	NGO
1	1	Muhammad Imran Khan (Graduate Student)	University of Agriculture, Pakistan	Academic
1	2	Brandt Douglas von Krieger	Canadian Coast Guard	Gov-Fed
1	3	Daniel Reid (Manager with OPP)	Transport Canada	Gov-Fed
1	4	Gyulia Borbely (Policy Practitioner)	Transport Canada	Gov-Fed

Room	Count	Name	Affiliation	Sector
1	5	Tyler Brand (CCG Readiness, building during-incident risk assessment tools in collab with Daniel Reid)	Canadian Coast Guard	Gov-Fed
1	6	Brian Kirk	Washington State, Department of Ecology	Gov-USA
1	7	Jim O'Neil (Aeronautical logistics)	unknown	Industry
1	8	Joe Spears (Maritime Lawyer, Oceanographer)	Horseshoe Bay Marine Group	Industry
1	9	Stephanie Snyder	Trans Mountain Pipeline Expansion	Industry
1	10	Petar Lolic	Dillon Consulting	Industry
2	A	**Facilitator - Michael Wallace**	Transport Canada	Gov-Fed
2	B	**Scribe - Tessa Coulthard**	Clear Seas	NGO
2	1	Ivana Kubat	National Research Council Canada	Gov-Fed
2	2	Adrian Nicoll	Transport Canada	Gov-Fed
2	3	George Armstrong	Transport Canada	Gov-Fed
2	4	Christine Konrad	Fisheries and Oceans Canada	Gov-Fed
2	5	Brandy Gladson	Fisheries and Oceans Canada	Gov-Fed
2	6	Stefania Gorgopa	Malahat Nation	Gov-Ind
2	7	Jillian Drover	Petroleum Development Section, NL	Gov-Prov

Room	Count	Name	Affiliation	Sector
2	8	Sam Davin	WWF-Canada	ENGO
2	9	Cheryl Bidgood	Unknown	unknown
3	A	**Facilitator - Ron Pelot**	MEOPAR	Academic
3	B	**Scribe - Juan Rivadeneira**	Dalhousie	Academic
3	1	Andrei Sedoff	Canadian Coast Guard	Gov-Fed
3	2	Khunsha Shaikh	Transport Canada	Gov-Fed
3	3	Yannick Lapierre	Fisheries and Oceans Canada	Gov-Fed
3	4	Desiree Bulger	Malahat Nation	Gov-Ind
3	5	William Hall	Malahat Nation	Gov-Ind
3	6	*Jillian Drover (moved from BR 2)*	*Petroleum Development Section, NL*	*Gov-Prov*
3	7	Meghan Mathieson	Clear Seas	NGO
3	8	Bob Gowe	unknown	unknown
3	9	Lee	unknown	unknown
3	10	Alex MacIntyre	unknown	unknown
4	A	**Facilitator - Floris Goerlandt**	Dalhousie	Academic
4	B	**Scribe - Piers Broadhead**	Dalhousie	Academic
4	1	Jagos Radovic	University of Calgary	Academic
4	2	Lauryne Rodrigues	Dalhousie	Academic
4	3	Mark Vukas	Canadian Coast Guard	Gov-Fed

Room	Count	Name	Affiliation	Sector
4	4	Alois Schonenberger	Transport Canada	Gov-Fed
4	5	Michelle Beaudoin	Transport Canada	Gov-Fed
4	6	Jeffrey Desson	Transport Canada	Gov-Fed
4	7	James Reid	Acuratek	Industry
4	8	Iain Braidwood	Iain Braidwood Consulting	Industry
4	9	Duke Snider	Martech Polar	Industry
4	10	Steve Falcon	unknown	unknown
5	A	**Facilitator - Jennifer Steele**	Clear Seas	NGO
5	B	**Scribe - Jim Hodgson**	Clear Seas	NGO
5	1	Norma Serra	University of Victoria	Academic
5	2	Imranul Laskar	UBC - IRES	Academic
5	3	Piper Harris	Canadian Coast Guard	Gov-Fed
5	4	Jerome Marty	Canadian Council of Academies	Gov-Fed
5	5	Catherine Trounce	Transport Canada	Gov-Fed
5	6	Mike Martens	Transport Canada	Gov-Fed
5	7	Steve Oates	Parks Canada	Gov-Fed
5	8	Dave Rolston	Tseshaht Nation	Gov-Ind
5	9	Dave Creber	Dillon Consulting	Industry
5	10	Catalda Van Dyke	unknown	Industry

APPENDIX D – INITIAL SUGGESTIONS TO POPULATE THE INVENTORY

Initiative / Resource Name	Organization / Owner(s)	Format (optional)	URL
Guideline for Arctic Marine Risk Assessment: Tools and Resources	Arctic Council, EPPR	Data Portal	https://eppr.dnvgl.com/tools/tools-and-resources
Guideline for Arctic Marine Risk Assessment	Arctic Council, EPPR	Guidelines	https://eppr.dnvgl.com/
IRGC Risk Governance Framework	International Risk Governance Center IRGC	Framework	https://www.epfl.ch/research/domains/irgc/concepts-and-frameworks/page-139715-en-html/
ISO Risk Management Guidelines	International Organization for Standardization	Guidelines	https://www.iso.org/obp/ui/#iso:std:iso:31000:ed-2:v1:en
Oil spill risk assessment and response planning for offshore installations	IPIECA	Best Practices	https://www.ipieca.org/resources/awareness-briefing/oil-spill-risk-assessment-and-response-planning-for-offshore-installations/
Canadian Arctic Shipping Risk Assessment System (CARSAS)	National Research Council Canada	Integrated system on external hard drive (a portable offline system combining datasets with custom analytics software)	https://nrc.canada.ca/en/research-development/products-services/technical-advisory-services/canadian-arctic-shipping-risk-assessment-system-casras

Initiative / Resource Name	Organization / Owner(s)	Format (optional)	URL
Petroleum Development Mapping Application Hub	Government of Newfoundland and Labrador	Data Portal	https://petroleum-development-mapping-application-hub-iet-gis.hub.arcgis.com/
Common Operating Picture	Canadian Coast Guard	Internal Monitoring Tool	
Open Canada - project with NASP	Project with Transport Canada	Data Repository	open.canada.ca/en
CCA report on integrated management	CCA	Report	https://cca-reports.ca/reports/the-state-of-knowledge-and-practice-of-integrated-approaches-to-natural-resource-management-in-canada/
Marine Emissions Inventory Tool	Environment and Climate Change Canada	Data Repository	https://www.canada.ca/en/environment-climate-change/services/managing-pollution/marine-emissions-inventory-tool.html
Stressor Interactions in the Great Lakes	IJC	Report	https://ijc.org/sites/default/files/2020-09/SAB-SPC_StressorInteractionsReport_2020.pdf
Environmental Sensitivity to Oil Exposure in the Great Lakes Waters: A Multimodal Approach	Report to Great Lakes Commission	Report	http://glslcrudeoiltransport.org/publication/environmental-sensitivity-to-oil-exposure-in-the-great-lakes-waters-a-multimodal-approach/
Spectrum of Governance Approaches	CCA	Figure	https://rph6l3wj8q-flywheel.netdna-ssl.com/wp-content/uploads/2019/04/Fig-5.1-EN.jpg
Transportation 2030 Initiative - Transportation data and information hub	Statistics Canada	Data Repository	https://www144.statcan.gc.ca/tdih-cdit/index-eng.htm

Initiative / Resource Name	Organization / Owner(s)	Format (optional)	URL
Proactive Vessel Management (four pilot projects)	Transport Canada		https://tc.canada.ca/en/marine-transportation/navigation-marine-conditions/proactive-vessel-management
Marine Emissions Inventory Tool (MEIT)	Environment and Climate Change Canada	Monitoring Tool	https://www.green-marine.org/wp-content/uploads/2018/06/Monica-Hilborn.pdf
Enhanced Maritime Situational Awareness (EMSA) Initiative	Transport Canada	Online Platform	https://tc.canada.ca/en/marine-transportation/navigation-marine-conditions/enhanced-maritime-situational-awareness-initiative-pilot-projects
TERMPOL	Transport Canada	Process	https://tc.canada.ca/en/marine-transportation/marine-safety/termpol-review-process-2019-edition-tp-743-e
Pilotage Risk Matrix	Pilotage Authorities		
Weather Buoy Documents	Environment and Climate Change Canada		
Quiet Vessel Initiative	Transport Canada	Initiative	https://tc.canada.ca/en/programs/quiet-vessel-initiative
Oceans Protection Plan	Transport Canada	Initiative	https://tc.canada.ca/en/initiatives/oceans-protection-plan