

CONTEXT

Canadian waters support an abundance of marine activities, including commercial shipping, research, tourism, fishing, hunting, leisure, and recreation; each of which presents different risk profiles. In Canada, there are three Joint Rescue Coordination Centers (JRCCs) and two sub-centers which operate 24/7 and are responsible for the the planning, coordination, conduct, and control of SAR operations in their region (Figure 1). Risk governance of maritime SAR is rooted in the ISO 31000 risk management standard and is further supported by various regulations and programs, national and international legislation, and cooperation agreements.

In the context of this research, risk governance refers to risk-related policy-making and decision-making surrounding how to cope with uncertain, complex and/or ambiguous risks. Risks include both operational risks (i.e. management related risks) and risks to the health and safety of the response crew and person(s) in need of rescue (e.g. seafarers, recreational boaters, etc.).

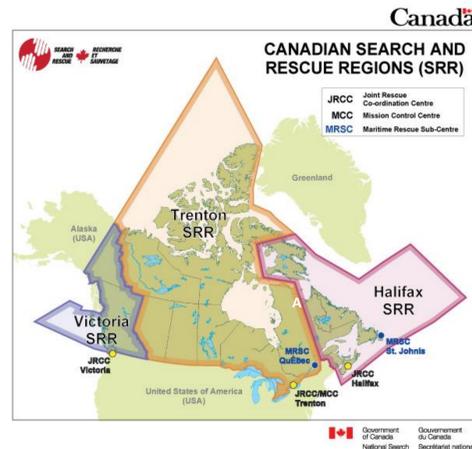


Figure 1. Location of coordination centers within the Canadian Search and Rescue Regions reproduced from Transport Canada¹

MANAGEMENT PROBLEM

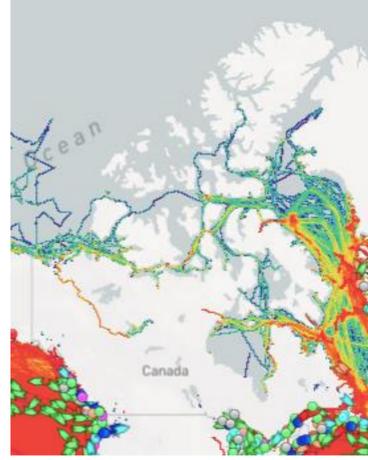


Figure 2. Density map of vessel traffic in Canadian waters from 2021, reproduced from MarineTraffic²

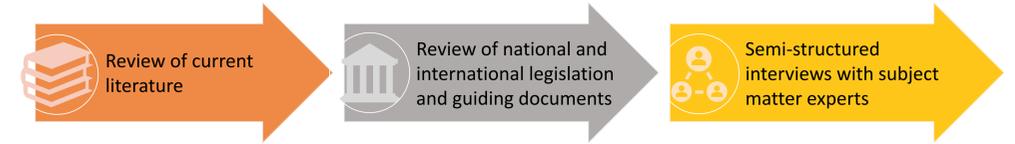
Maritime SAR is a complex risk problem associated with high uncertainty and requires the careful coordination of multiple partners.

Canadian waters pose a serious threat to the lives of mariners due to unpredictable conditions, subfreezing temperatures, a vast and often remote seascape, and potentially sparse resource availability (depending on the location and time of year). As vessel traffic is growing, there is a need for a comprehensive understanding of the federal SAR system.

RESEARCH OBJECTIVES

This research aims to understand the process of shipping risk governance in Canada; how it is regulated; the roles and responsibilities of each agency; and how they are being implemented. It also aims to understand the decision-making process; identify how stakeholders and rightsholders (i.e. Indigenous Peoples) are involved; explore the role of uncertainty and ambiguity in risk governance; and identify potential challenges and improvements in the current processes. The results can be used to better inform decision-making, enhance rightsholder and stakeholder engagement, contextualize risk governance issues, and ultimately improve maritime safety.

METHODS



Summary of Research Participants

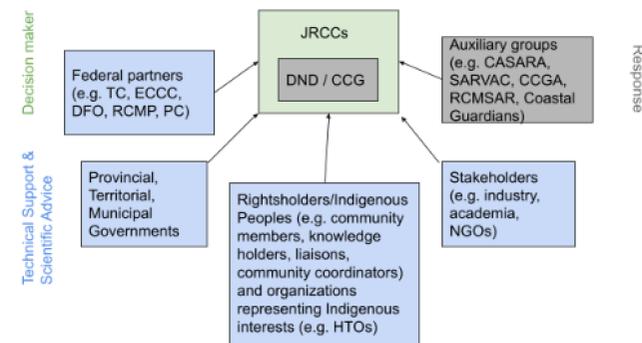
Affiliation	Department/Organization	Number of Interviews	Number of participants
Government	Transport Canada (TC)	1	3*
Government	Canadian Coast Guard (CCG)	6	9
Government	Environment and Climate Change Canada (ECCC)	1	1
Government Contractor	Regional Response Corporation	2	2
Total		10	15**

*The exact number of individuals is estimated as the interview responses were submitted in writing.
 **In addition to the above summary of participants, three separate discussions were held with members of TC, ECCC and CASARA to aid in our understanding, although not formally included in the interview data. This brings the total number of experts consulted on this project to 18 individuals.

RESULTS

Responsible parties

Figure 3. Overview of the National Maritime SAR Preparedness and Response Partners.



Achieving effective risk governance requires the coordination between numerous parties, each responsible for contributing to the various components of the SAR system (Figure 3). Although there are opportunities for stakeholders and rightsholders to support active response efforts³, more commonly they contribute to knowledge gathering through various discussion forums, Ocean Protection Plan initiatives⁴, and the Risk Based Analysis of Maritime Search And Rescue Delivery process⁵. However, a standardized engagement process is still lacking.

Decision-making

Maritime SAR is a highly formalized process, using the CAMSAR⁶ manual—the lead governing document in Canada—to coordinate and operationalize SAR response. Operating under one common system (i.e. the federal SAR system) improves coordination between response agencies. This enhances response capacity and capability and increases survivability in the event of an incident.

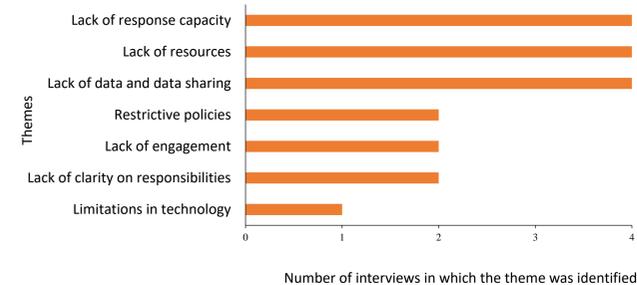
Although the decisions are ultimately left up to the SAR mission coordinator within the appropriate JRCC, decision-support tools do exist. For example, RAMSARD provides a framework to identify stakeholder concerns and manage risk-related decision-making for maritime SAR delivery, preparedness, and response. It uses risk analysis to assess and evaluate preparedness, allocate resources, and identify gaps in the SAR system.

Figure 4. Area SAR Risk Estimation Matrix, Modified from the Risk Based Analysis of Maritime Search And Rescue Delivery (RAMSARD) Manual⁵

Impact	Likelihood				
	Rare	Unlikely	Moderate	Likely	Almost Certain
Extreme	Green	Yellow	Orange	Red	Dark Red
High	Green	Yellow	Orange	Red	Dark Red
Moderate	Green	Yellow	Orange	Red	Dark Red
Low	Green	Yellow	Orange	Red	Dark Red
Negligible	Green	Yellow	Orange	Red	Dark Red

Barriers and improvements

Figure 5. Barriers to Risk Governance for Maritime SAR Preparedness and Response in Canadian Waters



When asked how risk governance for maritime SAR could be improved, participants suggested 3 main areas of focus:

- 1) Increasing response capacity (must be proportionate to the level of risk);
- 2) Increasing engagement; and
- 3) Enhancing charting (specifically in the Arctic) to better document high-risk areas and improve navigational safety.

CONCLUSION

The results indicate that shipping risk governance varies between regions depending on the availability of resources, programs, and capabilities. The results also suggest that despite the availability of decision-support tools, there is a heavy reliance on expert judgment, informed by years of experience and SAR training.

ACKNOWLEDGEMENTS

This research received funding from the Canada First Research Excellence Fund through the Ocean Frontier Institute and from Clear Seas Centre for Responsible Marine Shipping. The authors are also grateful for the kind support by the domain experts in facilitating this research.

REFERENCES

1. Transport Canada. (2021, October 7). *Aeronautical information manual – Effective 0901Z, October 7, 2021 to 0901Z, March 24, 22. TP 14371E (2021-2)*. pg. 336.
2. Marine Traffic. (2021). *Density maps*. Accessed April 21, 2022. <https://www.marinetraffic.com/en/ais/home/centers:-127.2/center:6A.5/zoom:2>
3. Cucinelli, J., Goerlandt, F., & Pelot, R. (2021, November 8). *Maritime search and rescue and shipping risk: How does it work in Canada?* Clear Seas.
4. Transport Canada. (2021, March 3). *Improving marine safety through the Oceans Protection Plan*. <https://tc.canada.ca/en/initiatives/oceans-protection-plan/improving-marine-safety-through-oceans-protection-plan#toc16>
5. Canadian Coast Guard. (2017, November). *Risk Based Analysis of Maritime SAR Delivery*. EKME # 2
6. Department of Fisheries and Oceans Canada. (2014, September 30). *Canadian aeronautical and maritime search and rescue manual*. <https://ccga-pacific.org/training/manuals/CAMSAR-2014-english-signed.pdf>