

**Regional Response Planning (RRP) for Ship-Source Oil Spills in Canada: Assessing
the Implementation Status of Recommendations and Integration into an RRP Framework**

by

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ABSTRACT

In 1995, the National Oil Spill Preparedness and Response Regime (NOSPRR) was established by Transport Canada. Although there has not been a major spill in Canadian waters since NOSPRR was implemented, experts have indicated that Canada remains at risk for a spill. Recent statistical modelling suggests that Canada could experience a major marine oil spill every year, and a catastrophic spill once every fifteen years. In 2013, the Tanker Safety Expert Panel (TESP) published a review of Canada's National Oil Spill Preparedness and Response Regime, and recommended that Canada shift to an area-based planning approach. In 2014, a nationwide Area Risk Assessment (ARA) indicated that there are regional variations in the level of risk (probability) and/or impact (consequences) of a marine oil spill.

Other than two pilot projects (the Area Response Planning Initiative (ARPI) and the British Columbia Regional Response Plan Project), there is no clear indication of a shift toward Regional Response Planning (RRP). An effective RRP framework would mitigate adverse impacts to the Canadian environment, economy, and society in the event of a catastrophic spill.

This paper proposes an adaptive RRP framework that can be applied to at-risk regions across Canada. The framework was built using recommendations from the TSEP and the ARPI. The framework begins with Initiation, and is followed by six phases: Region, Risk, Prevent, Prepare, Respond, and Review. This framework emphasizes: stakeholder and rightsholder engagement; expert involvement and science-based decision-making; open communication and data sharing between government departments; and establishment of a standard process for national use. Feedback loops are included to ensure the management (response) is adaptable and responsive to regional changes. Finally, an action plan is required to ensure RRP is implemented within a reasonable timeframe. Ideally, the development of an RRP approach to oil spill management should be a proactive rather than reactive process.

Keywords: marine oil spill; policy; regional based management; adaptive management; shipping; marine transportation; response organization

LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|----------|---|
| AIS | Automatic Identification System |
| ALERT | Atlantic Emergency Response Team |
| AMOP | Arctic Marine Oil Spill Program |
| ARA | Area Risk Assessment |
| ARP | Area Response Planning |
| ARPI | Area Response Planning Initiative |
| BRI | Biological Resource Indicator |
| CCG | Canadian Coast Guard |
| CEAA | Canadian Environmental Assessment Agency |
| CEPA | <i>Canadian Environmental Protection Act</i> |
| CLC | International Convention on Civil Liability for Oil Pollution Damage 1969 |
| CMAC | Canadian Marine Advisory Council |
| CPA | Canadian Port Authority |
| CSA | <i>Canada Shipping Act</i> |
| CSA 2001 | <i>Canada Shipping Act, 2001</i> |
| DCL | Dillon Consulting Limited |
| DFO | Fisheries and Oceans Canada |
| EBSA | Ecologically and Biologically Significant Areas |
| ECCC | Environment and Climate Change Canada |
| ECRC | Eastern Canada Response Corporation Ltd. |
| EEZ | Exclusive Economic Zone |
| EPRNPP | Environmental Prevention and Response National Plan |
| ERI | Environmental Risk Index |
| ESI | Environmental Sensitivity Index |
| GAR | Geographic Area of Response |
| GRP | Geographic Response Plan |
| GRS | Geographic Response Strategies |
| HRI | Human-use Resource Index |
| ICS | International Commission on Shipping |
| IMO | International Maritime Organization |

| | |
|--------|---|
| IOPC | International Oil Pollution Compensation Fund |
| ISTOP | Integrated Satellite Tracking of Pollution |
| JC | Justice Canada |
| MCTS | Marine Communications and Traffic Services |
| MLA | Marine Liability Act |
| MPCF | Marine Pollution Claims Fund |
| MSMS | Marine Safety Management Plan |
| Mt | Million Tonnes |
| NASP | National Aerial Surveillance Program |
| NOSPRR | National Oil Spill Preparedness and Response Regime |
| NPP | National Preparedness Plan |
| OPP | Ocean Protection Plan |
| PTMS | Point Tupper Marine Service Ltd. |
| REET | Regional Environmental Emergency Teams |
| RO | Response Organization |
| RRP | Regional Response Planning |
| SARA | Species at Risk Act |
| SOA | Special Operating Agency |
| SOPEP | Ship Oil Pollution Emergency Plan |
| SOPF | Ship-Source Oil Pollution Fund |
| TC | Transport Canada |
| TSB | Transport Safety Board |
| VTS | Vessel Traffic Services |
| WCMRC | Western Canada Marine Response Corporation |

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CHAPTER 1: INTRODUCTION

At over 243,000 kilometers, Canada has more coastline than any other country (TC, 2020b). Canada relies on marine shipping for both imports and exports (TC, 2020g). Approximately 80 million tonnes of oil are annually transported along Canada's coasts, and each day almost two hundred commercial vessels move within Canada's exclusive economic zone (EEZ) (TC, 2020b). While shipping of oil and gas continues to grow significantly, the Government of Canada has worked to create a world-leading marine safety system to protect Canadian waters and coastal communities (TC, 2020b; TC, 2020g).

Over a hundred regulations, laws, and international agreements are enforced by federal departments such as Transport Canada, Fisheries and Oceans and the Canadian Coast Guard, and Environment and Climate Change (TC, 2020g). Transport Canada (TC) is the lead organization that manages marine oil spills in Canada (TC, 2018). They are responsible for developing and enforcing regulations and acts (such as the Canada Shipping Act), conducting risk assessments, monitoring and reporting marine spills, and providing leadership for organizations such as the International Maritime Organization (IMO) and Arctic Council – Emergency Prevention, Preparedness and Response Working Group (TC, 2018; TC, 2020b). The Canadian Coast Guard (CCG), a division of Fisheries and Oceans Canada (DFO) is responsible for managing spills by managing the National Response Team (NRT) and acting as the Federal Monitoring Officer and/or On-Scene Commander (TC, 2018).

In 1995, TC established the National Oil Spill Preparedness and Response Regime (TC, 2019a). This framework holds ship owners accountable in the event of a spill (Leavitt, 2020). It established a "Marine Pollution Claims Fund", which was later adapted to the "Ship-source Oil Pollution Fund" (Leavitt, 2020). While there has not been a major spill in Canadian waters in the last few decades, studies have predicted a catastrophic marine oil spill once every fifteen years, and a major spill (>700 tons) every year (TC, 2020g; TSEP, 2013). Canada has continued to strive to improve preparedness and response capabilities (TC, 2019c). The 2017 Ocean Protections Plan announced plans to "optimize oil spill response" (Lee et al. 2020).

In 2013, the Tanker Safety Expert Panel (TESP) published the first review of this framework since its implementation (TSEP, 2013). The TSEP made 45 recommendations, one of which recommended area-based planning (TSEP, 2013). In 2014, TC and the Canadian Coast Guard (CCG) launched the Area Response Planning (ARP) initiative in response (TC, 2018). This pilot project used region-specific variables to create an optimized response plan for four geographic regions (TC, 2018). Key findings from this study were used to inform the development of a Regional Response Plan (RRP) in southern British Columbia (TC, 2018). Beyond these two projects, there has been no clear movement toward a national use of RRP. A shift from a national strategy to a regional strategy would not require a complete overhaul, as there are a number of regional components already integrated in the management strategy.

1.1. Management Problem

The management problem addressed herein is how to optimize Canada's response regime to reduce the risk and minimize the impact of a marine oil spill. Ship-source oil spill management in Canada is comprised of three components: prevention; preparedness and response; liability and compensation (TSEP, 2013). This project focuses on the first two components, which are the legislative and regulatory frameworks established in Canada.

Research Question: What key lessons need to be considered when proposing a shift from a national response strategy to a regional response strategy? How can a Regional Response Planning management strategy be implemented?

- **Sub-question 1:** What are the key risk and area-based response recommendations from the Tanker Safety Expert Panel? Have these points been addressed?
- **Sub-question 2:** What are the recommendations and key findings of the Area Response Planning pilot project? What worked well in this project, what did not work well, and what gaps were there?
- **Sub-question 3:** How can these points be addressed and integrated into a framework for Regional Response Planning?

Scope: This project focuses on shipping in southern Canadian waters, and related spill preparedness and response management. Issues in Arctic waters (north of 60°N), are not a focus

for this study, as they are not currently managed by the National Oil Spill Preparedness and Response Regime.

Stakeholders: Stakeholders include municipal, provincial and federal government departments, Indigenous Peoples, shipping industry, academia and experts, Non-Governmental Organizations (NGOs), public and private response organizations (ROs), other ocean users (fisherman, energy, tourism, etc.), and the general public.

1.2. Research Approach

The objectives of this study are to review the Area Response Planning (ARP) project and use the key findings to set up effective guidelines for establishing RRP. The deliverables of this project include a review of oil spill preparedness in Canada, presented as a timeline of important events, and background on the current national plan. This paper assesses the implementation status of recommendations made by the TSEP and the ARP pilot project (including limitations and recommendations, as well as risk-based and site-specific management strategies to formulate a framework for the proposed RRP).

This paper is broken down into chapters addressing the sub-questions. Chapter 2 provides background information about oil spill preparedness and response in Canada since 1970, and reviews the current conditions in Canada (the national regime, compensation and liability, response organizations, and shipping). Chapter 3 introduces the Tanker Safety Expert Panel and provides an overview of the TSEP review and key recommendations (sub-question 1). Chapter 4 reviews the Area Risk Assessment methods and results. Chapter 5 summarizes the Area Response Plan (ARP) pilot project, successes and shortcomings, the key findings and recommendations, and gaps in the project (sub-question 2). Chapter 6 integrates points identified in previous chapter into a management framework, effectively setting up guidelines for a broadly applicable regional management structure (sub-question 3). Chapter 7 discusses the key findings, limitations and potential for future studies. Chapter 8 presents management recommendations.

CHAPTER 2: BACKGROUND

2.1. History



Figure 1. The *S.S. Arrow* (left) and the *Irving Whale* (right – pictured when it was raised in 1996) both sunk in the Atlantic region in 1970 (SOPF, n.d.)

On February 4, 1970, The Liberian-registered *S.S. Arrow* (Figure 1, left) tanker ran aground in Chedabucto Bay, Nova Scotia (Leavitt, 2020; Lee et al., 2020). Four days later, the hull of the *S.S. Arrow* split in two, and as she sank, she spilled 10,000 tonnes of Bunker C fuel oil into the bay (Leavitt, 2020). Within a week, over 300 km of shoreline in Cape Breton were contaminated (Leavitt, 2020). This remains the largest oil spill in Canadian history, killing over 2500 birds, and costing the government millions to recover and dispose of spilled oil (Leavitt, 2020). While this spill negatively impacted tourism, fisheries and wildlife in the region, this tragedy came with its own silver lining. Following the spill, the government began the long process of developing an effective oil spill prevention and response regime in Canada.

In the same year, the *Irving Whale*, an oil supply barge (Figure 1, right), sank off the coast of Prince Edward Island (PEI) with 4,200 tonnes of bunker C fuel oil aboard (CBC, n.d.). The oil covered a combined 140 km of shoreline in PEI and the Magdalen Islands, and cost over three million dollars to clean (CBC, n.d.). Due to gaps in the regulations, Irving Oil was not under Canadian territorial seas jurisdiction (beyond the 12 nm limit), and there was no effort to recover the sunken barge (CBC, n.d.). This further prompted the Canadian government to create legislation to increase government control over marine oil spills (CBC, n.d.).

Unlike the East Coast, the West Coast has not seen a major spill: in 2006 the *MV Queen of the North* sank and spilled 240 tonnes, and in 2015, the *MV Marathassa* spilled 2.7 tonnes in Vancouver's English Bay (TC, 2020b). However, in 1989, the supertanker *Exxon Valdez* ran aground on Bligh Reef in Alaska, spilling 44,000 tonnes of oil (SOPF, n.d.). While this spill

occurred in United States (US) waters, there were still impacts to Canadians and lessons to be learned.

Throughout recent decades, there have also been legal and regulatory changes. There have been amendments to legislation such as the Marine Liability Act, and the Canada Shipping Act, as well as the creation of new legislature, such as the Ocean's Act and the Ocean Protection Plan. While some of these changes were successful, other attempted legislative changes, such as the Oil Tanker Moratorium Act (Bill C-48), have experienced delays and setbacks (TC, 2020i). If passed, this act would prohibit oil tankers carrying more than 12,500 metric tons of crude oil or persistent oil from stopping or unloading in ports along British Columbia's north coast (Hewson, 2019; TC, 2020i).

A detailed timeline of additional major oil spills, legislative happenings and other domestic and international events is presented in Table 1.

Table 1. (next page) Timeline of important events (spills, documents, policies, etc.) nationally and internationally related to oil spill preparedness and response.

Table 1: Timeline of Important Events

- 1970** – The *SS Arrow* tanker runs aground in Nova Scotia, spilling 8,000 tonnes of oil. The *Irving Whale* barge sinks off the coast of Prince Edward Island carrying 4,200 tonnes of Bunker C oil (Leavitt, 2020).
- 1971** – Canada Shipping Act (CSA) is amended to establish the Maritime Pollution Claims Fund (MPCF) as a last-resort fund (SOPF, n.d.). This was funded by a 15-cent levy per tonne in 1972-1976 (SOPF, n.d.).
- 1975** – 1969 Civil Liability Convention (CLC) comes into force to ensure compensation is paid to victims and shipowners are held liable in the event of a spill (IMO, 2019).
- 1976** – Establishment of Burrard Clean Operations, Canada’s first marine spill response organization (WCMRC, 2020).
- 1978** – 1971 Fund Convention comes into force, establishing the International Fund for Compensation for Oil Pollution Damage, in the event that damages exceed the funds available under the CLC (IMO, 2019).
- 1979** – The *Kurdistan* spills 7,500 tonnes of oil in the Cabot Strait.
- 1985** – Arctic Waters Pollution Prevention Act A-12
- 1989** – Canada adopts international liability and compensation scheme, accedes to the CLC 1969 and the IFC (SOPF, n.d.). The MPCF is adapted into the Ship-source Oil Pollution Fund (SOPF) which provides compensation above the international conventions (SOPF, n.d.)
- 1989** – Major spill from the Exxon Valdez on the Pacific Coast prompts the establishment of the Public Review Panel on Tanker Safety and Marine Spills Response Capability and Green Plan Funding.
- 1990** – The *Rio Orinoco* runs aground in the Gulf of St. Lawrence and spills 200 tonnes of fuel oil (SOPF, n.d.).
- 1992** – The 1969 CLC and 1971 IOPC Fund Convention adopted internationally (SOPF, n.d.)
- 1993** – CSA is amended to establish a framework for oil spill preparedness and response founded on CCG and private response organizations (SOPF, n.d.)
- 1995** – National Oil Spill Preparedness and Response Regime officially established
- 1995** – Response Organizations are certified by TC: Western Canada Marine Response Corporation (WCMRC) (Burrard Clean Operations became a division of WCMRC), Atlantic Emergency Response Team (ALERT), Point Tupper Marine Service Ltd. (PTMS), and Eastern Canada Response Corporation (ECRC) (WCMRC, 2020; TC, 2017b).
- 1996** – Ocean Act outlines Canada’s National Ocean Management strategy. This strategy is based on three key principals: sustainable development, integrated management, and the precautionary approach (Justice Canada, 2019b).
- 1999** – CSA amended to accede to the 1992 CLC and IOPC Fund (SOPF, n.d.)
- 2001** – Bunkers Convention (BC) adopted internationally (SOPF, n.d.)
- 2001** – Marine Liability Act (MLA) (SOPF, n.d.)
- 2002** – Bedford Institute of Oceanography (BIO) established the Centre for Offshore Oil, Gas and Energy Research (COOGER) to study and provide advice on major oil spills (Lee et al., 2020).
- 2003** – Protocol on the Establishment of a Supplementary Fund for Oil Pollution Damage (IMO, 2019).
- 2013** – Tanker Safety Expert Panel Report “A Review of Canada’s Ship-source Oil Spill Preparedness and Response Regime – Setting the Course for the Future” published providing recommendations on oil spill preparedness and response in Canada (TSEP, 2013)
- 2014** – Area Response Planning (ARP) Pilot Project looks at four case studies: Southern British Columbia, the St. Lawrence, the Bay of Fundy, and the Strait of Canso.
- 2015** – Regional Response Planning (RRP) project in Southern British Columbia. The *MV Marathassa* spills 2.7 tonnes of fuel in Vancouver’s English Bay (CCG, 2019).
- 2016** – Regional Action Framework for British Columbia is completed by Marine Plan Partnership for the North Pacific Coast (MaPP).
- 2017** – Ocean Protection Plan is announced, which includes initiatives to optimize oil spill response (Lee et al., 2020). Bill C-48, the *Oil Tanker Moratorium Act*, is sponsored by Transportation Minister.
- 2018** – Legislative amendments modernize the Marine Liability Act (MLA) come into force (SOPF, n.d.)

2.2 National Oil Spill Preparedness and Response Regime

Canada's Environmental Prevention and Response National Preparedness Plan (NPP) is built on the "polluter-pay" principle. It is an industry-government (private-public) partnership, and provides guidelines and regulations for marine oil spills (WCMRC, 2020; TC, 2018; TSEP, 2013). This regime is based on three acts/regulations: *Canada Shipping Act, 2001*, the *Response Organization and Oil Handling Facilities Regulations*, and the *Environmental Response Arrangement Regulations* (TSEP, 2013). There are six guiding principles:

- Effective and responsive legislation,
- Potential polluters pay for preparedness,
- Polluter pays for reasonable response costs,
- Partnership with industry
- Comprehensive contingency plans,
- Mutual agreements with neighbours (TC, 2018).

The NPP requires ships travelling through Canadian waters to have insurance, a Ship Oil Pollution Emergency Plan (SOPEP), and an arrangement with a response organization. This ensures that spills of up to 10,000 tonnes are responded to according to the prescribed standard (TC, 2019).

Response organizations have the infrastructure and technology to clean-up a spill, and CCG monitors the response and clean-up to ensure it is efficient, effective and appropriate (TC, 2018). The Canadian Coast Guard (CCG), a Special Operating Agency (SOA) under the DFO portfolio, is responsible for responding to spills by managing the National Response Team (NRT) (TC, 2018). The National Aerial Surveillance Program runs aerial pollution patrols to detect spills (TC, 2020b). Overall, this management framework has been effective, and Canada has not had a significant marine spill in over 40 years.

Within the national framework, there are pre-existing regional components: Regional Advisory Councils, Regional Environmental Emergency Teams, and Geographic Response Strategies.

- The Regional Advisory Councils make recommendations on preparedness and response in six regions (Arctic, Maritimes and Newfoundland, Ontario, Pacific and Quebec) (TC, 2013). RACs are comprised of up to seven members, and aim to represent a balance of local communities and interests. Within the reviewed literature, there are mixed opinions regarding the RACs: some studies recommend disbanding the RACs, while others suggest creating more Regional Community Advisory Councils (RCAC) (Nuka, 2016).
- The Regional Environmental Emergencies Teams (REETs) are chaired (or co-chaired) by Environment Canada. They provide an opportunity for discussion of scientific advice and information pertaining to marine pollution incidents (TC, 2016a). If a spill occurs, the REET provides scientific and environmental expertise to the CCG (TC, 2016a). The REET models spill movement and trajectory, approves clean-up techniques, and ensures partners work together to effectively and efficiently clean up a spill.
- Geographic Response Strategies are site-specific plans that are already in place within two of the four TC-certified response organizations. The other two organizations do not have GRSs due to the size of their area of response. GRSs are created by individual response organizations.

2.3. Liability and Compensation

When an individual or corporation suffers damages following a marine oil spill incident, they can file a claim and may receive compensation (TC, 2020f). Types of claims include:

- Pollution prevention measures
- Clean-up costs
- Property damage
- Fisheries losses
- Subsistence losses
- Tourism losses
- Environmental remediation
- Food, social and ceremonial losses (TC, 2020f)

When an individual is submitting a claim, they must include information such as:

- “A description of the incident,
- A description of the loss or damages... or the cost that you’ve incurred because of the incident” (TC, 2020f)
- Invoices (suggested)
- Photographs (suggested)
- Explanatory notes (suggested)
- Account ledgers (suggested)

Three funds are available to provide compensation in the event of damages resulting from a marine oil spill: the International Oil Pollution Compensation fund (the IOPC, established in 1971 by the International Convention), the International Convention on Civil Liability for Oil Pollution Damage 1969 (CLC), and the Ship-source Oil Pollution Fund (SOPF). IOPC and CLC are international funds, while the SOPF is a Canadian compensation fund. The three funds are accessed in succession (SOPF, 1995), as demonstrated in Figure 2. The CLC has approximately \$145 million available per incident, the IOPC has around \$1.2 billion available per incident, and the SOPF have removed their limit, making \$400 million available (Hage, 2015). Collectively, there is currently \$1.6 billion available in compensation following a marine pollution incident (Hage, 2015).

The International Oil Pollution Compensation Fund (IOPC) was established in 1978 to provide compensation to victims of oil spills in member states (IOPC, 2020, SOPF, 2020). Canada joined in 1989 (IOPC, 2020). It operates under the 1969 International Convention on Civil Liability for Oil Pollution Damage and the 1971 International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (Fund Convention) (IOPC, 2020). The IOPC is funded by levies on the importation of large (more than

150,000 tonnes) quantities of oil (IOPC, 2020). In 1992, the compensation amount was increased under the 1992 Civil Liability Convention (CLC) and the Fund Convention (IOPC, 2020).

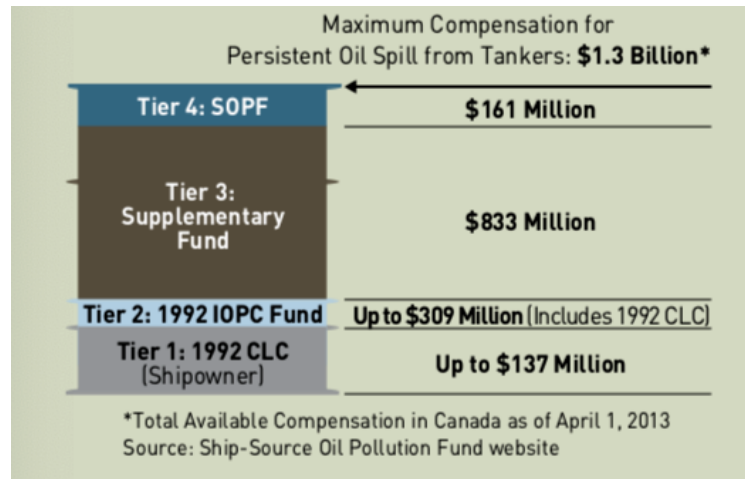
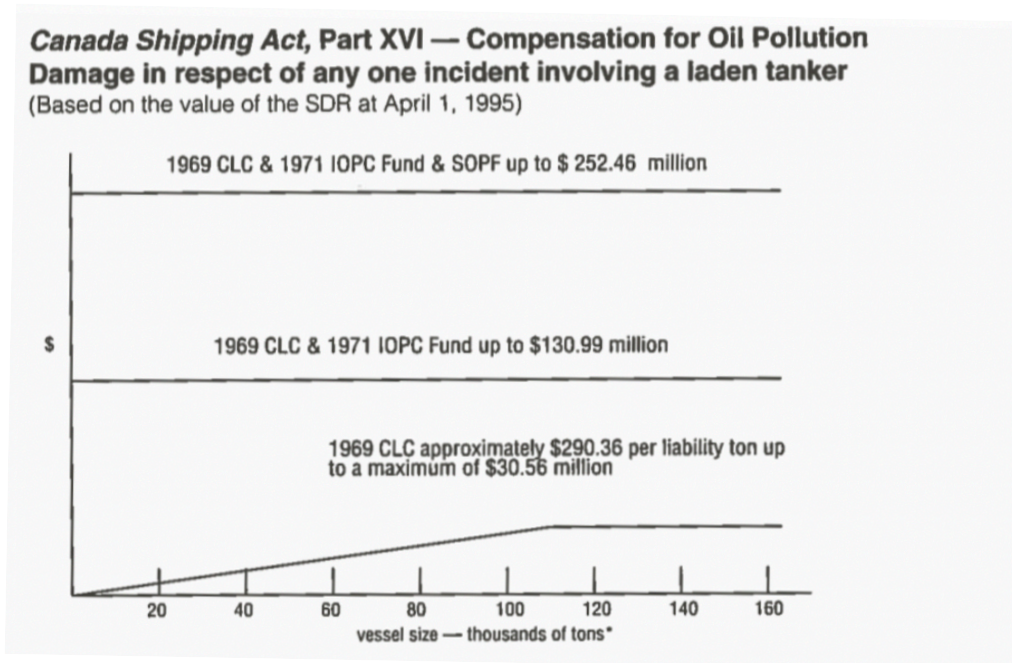


Figure 2. Compensation for oil pollution damage can be accessed in succession under the CLC, IOPC and SOPF. The top image shows the fund structure in 1995, and the bottom image shows a more recent version (from SOPF, 1995; TSEP, 2013). The structure of the compensation funds has remained consistent, but the amount available has increased.

The SOPF is intended to be a fund of last resort (SOPF, 2000). If the polluter evades responsibility, organizations such as the CCG can use SOPF for first response funding. There is currently no limit on compensation for eligible claims (previously, there was a limit of \$161 million) (TC, 2020h; Hage, 2015). The SOPF releases annual reports detailing the fund’s finances. Table 2 shows the growth of the SOPF balance since 1995.

Table 2. Financial details of the Ship Source Oil Pollution Fund since 1995 (at 5-year intervals) demonstrating the growth of the SOPF balance.

| Fiscal Year | SOPF Balance | Limit of Liability (per spill) | Levy | Paid from the SOPF |
|-------------|------------------|--------------------------------|------|--------------------|
| ‘94-‘95 | \$233,261,036.39 | \$121,474,002 | None | \$2,903,695.55 |
| ‘99-‘00 | \$295,522,385.23 | \$131,634,422.80 | None | \$273,807.10 |
| ‘04-‘05 | \$339,108,934.22 | \$145,320,000.00 | None | \$3,448,152.80 |
| ‘09-‘10 | \$389,030,912.00 | \$155,318,424.00 | None | \$0 |
| ‘14-‘15 | \$408,650,294.00 | \$165,837,463.00 | None | \$129,756.40 |
| ‘18-‘19 | \$408,035,420.00 | \$174,611,294.00 | None | \$2,711,090.00 |

Each year the Ship-Source Oil Pollution Fund publishes a report summarizing all incidents that triggered a claim to the fund. Figure 3 shows annual claims divided by region, (Atlantic, Pacific, Great Lakes, and Gulf of St. Lawrence) to demonstrate any differences in the rate of change of incident per year. This figure shows the greatest increase in annual claims from 1995 to present occurred in the Pacific region. The Atlantic region also saw an increase in average annual claims. Both the Great Lakes and Gulf of St. Lawrence displayed a decrease in annual claims.

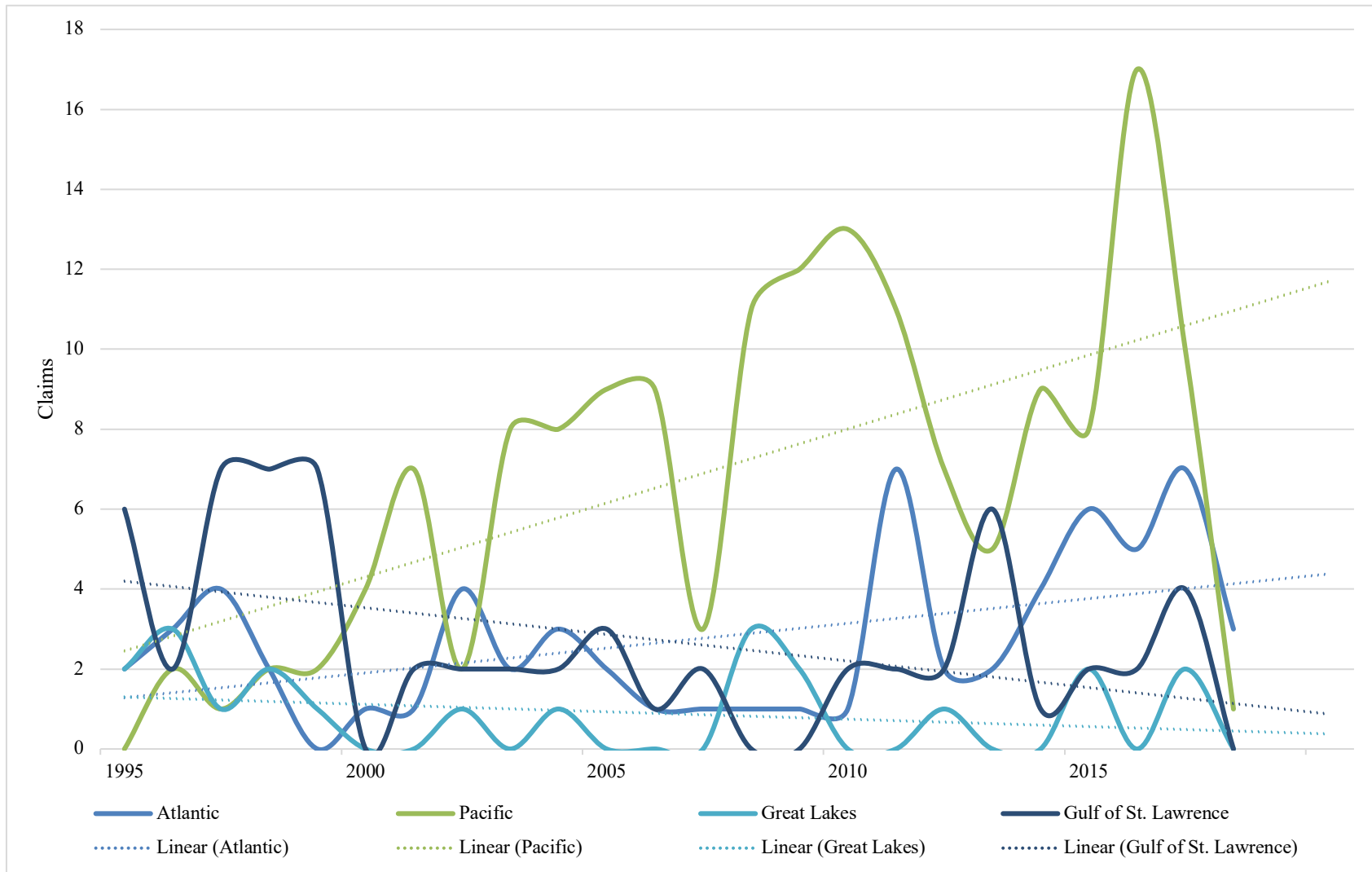


Figure 3. Annual claims to the SOPF. Incidents were separated by region (Atlantic, Pacific, Great Lakes, and Gulf of St. Lawrence) to identify different rates of changes. This figure shows the greatest increase in annual claims from 1995 to present occurred in the Pacific region. The Atlantic region also saw an increase in average annual claims. Both the Great Lakes and Gulf of St. Lawrence displayed a decrease in annual claims.

2.4. Response Organizations

Response Organizations are subject to the Response Organization Regulations and the Canadian Shipping Act. According to Shipping Act (171a-f), response organizations are required to: (a) have a response plan that meets the prescribed requirements; (b) have the prescribed equipment and resources at the site set out in the response plan; (c) provide or arrange for prescribed training to prescribed classes of persons; (d) undertake and participate in prescribed activities to evaluate the response plan or its implementation; (e) on the request of a vessel or the operator of an oil handling facility with which the response organization has an arrangement referred to in paragraph 167(1)(a) or 168(1)(a), as the case may be, implement a response consistent with the response plan; and (f) on the request of the Minister or an advisory council established under section 172, provide information regarding any of the matters referred to in paragraphs (a) to (e).

In the event of a significant spill (one that a vessel is unable, or unwilling, to respond to independently), the TC-certified RO in that region will be called to respond. If the polluting ship is unknown, the CCG will respond. Each response organization is required to maintain response capabilities for an oil spill of up to 10,000 tonnes (independently or through mutual aid agreements) (ITOPF, 2018). They must be able to complete on-water recovery (in up to Beaufort Force 4) within 10 days, have adequate storage, and treat 500 meters of shoreline each day (ITOPF, 2018).

There are four certified response organizations: The Western Canada Marine Response Corporation (WCMRC), Eastern Canada Response Corporation (ECRC), Atlantic Emergency Response Team (ALERT) and Point Tupper Marine Services Ltd (PTMS) (TSEP, 2013). These organizations are certified for three years, after which they must be re-certified by TC (TC, 2020e). Before the TC certification in 1995, there were private response co-operatives and private business such as Saint John Response Organization, Point Tupper Marine Organization, Burrard Clean Operations. These were integrated or re-named into one of the four current ROs.

The WCMRC is the only TC-certified RO on the Pacific (West) Coast. Canada's Pacific Ocean jurisdiction spans 450,000 km² of ocean, borders 37,000 km of coastline, and includes

approximately 6,500 islands (DFO, 2019b). Major ports for oil are Vancouver, Prince Rupert and Kitimat (TC, 2020b). On the West coast, there are around 200,000 vessel movements, of which approximately 1% are tankers (TC, 2020b). The largest spill in this region was the *MV Queen of the North* in 2006 (TC, 2020), which spilled 240 tonnes of oil (TC, 2020b).

The other three response organizations are on the Atlantic (East) Coast. This region is divided into 3 bioregions: The Gulf of St. Lawrence, Scotian Shelf, and the Newfoundland and Labrador Shelves. (DFO, 2019a). Major ports include Halifax (NS), Saint John (NB), Port Hawkesbury (NS), and Come-by-Chance (NL). The Atlantic region annually sees about 20,000 inbound vessels (TC, 2020b). Each year, the St. Lawrence has 25 million tonnes of crude oil and petroleum products loaded or unloaded (TC, 2020b). There are 39 ports in the St. Lawrence region, but almost 90% of crude oil and petroleum products are transported through the ports in Quebec City and Montreal (TC, 2020b). ECRC operates throughout much of the Atlantic region, whereas ALERT and PTMS have smaller areas of operation. ALERT services the Bay of Fundy and Saint John region, and PTMS services Port Hawkesbury and the surrounding region.

The geographic areas of the four TC certified response organizations are shown in Figure 4.



Figure 4. Figure adapted from the Tanker Safety Expert Panel’s “A Review of Canada’s Ship-source Oil Spill Preparedness and Response Regime – Setting the Course for the Future” identifying the four Transport Canada certified Response Organizations and their geographic areas of response (TSEP, 2013, p. 3).

2.5. Shipping in Canada

Each year, large quantities of commodities such as agriculture and food products, minerals, coal, fuels and basic chemicals, forest and wood products, pulp and paper products, machinery and transportation equipment, and manufactured and miscellaneous goods travel along the Canadian coast, and are imported and exported through Canadian ports. Canada has over 500 ports; around 18 are classified as Canada Port Authorities (CPAs), and the remainder are comprised of regional, local, and remote ports (TC, 2020a). Prominent ports include Vancouver, Montreal, Québec City, Sept-Isles, Saint John, Halifax, Port Hawkesbury, and St. Johns (TC, 2020a). Canadian ports have been experiencing an increase in cargo loaded and unloaded, number of ships, and overall business (TSEP, 2013).

Approximately 80 million tonnes of oil are transported annually along Canada’s coasts. Since the creation of the NPP, the volume of oil and types of vessel transporting that oil has changed (TC, 2020b). TC is the lead organization when it comes to shipping and responding to marine oil spills in Canada (TC, 2018). They are responsible for developing and enforcing regulations, conducting risk assessments, monitoring and reporting marine spills (TC, 2018). TC partners with other organizations such as the CCG, DFO, and International Maritime Organization (IMO) (TC, 2018). Shipping in Canada is regulated by several federal and international acts, regulations, and conventions (Clear Seas, 2020). These include, but are not limited to:

- Canada Shipping Act, 2001 (regulatory body: TC)
- Oceans Act (regulatory body: DFO)
- Transportation of Dangerous Goods Act (regulatory body: TC)
- Canadian Environmental Protection Act, 1999 (CEPA) (regulatory body: ECCC)
- Environmental Prevention and Response National Preparedness Plan (NPP) (regulatory body: TC)
- Marine Liability Act (MLA) (regulatory body: TC)
- Response Organizations Regulations (regulatory body: TC)
- International Convention for the Prevention of Pollution from Ships (MARPOL) (Regulatory body: UN/IMO)
- International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) (Regulatory body: UN/IMO)
- International Convention on Civil Liability for Oil Pollution Damage (CLC) (Regulatory body: UN/IMO)

Historic annual volume of shipping in Canada can be accessed in the “Shipping in Canada” publications, which were available up to 2011. Since then, less-detailed “Transportation in Canada” reports are available. Examples below (Figure 5 and Figure 6) show how overall changes in shipping occur at different rates in each region.

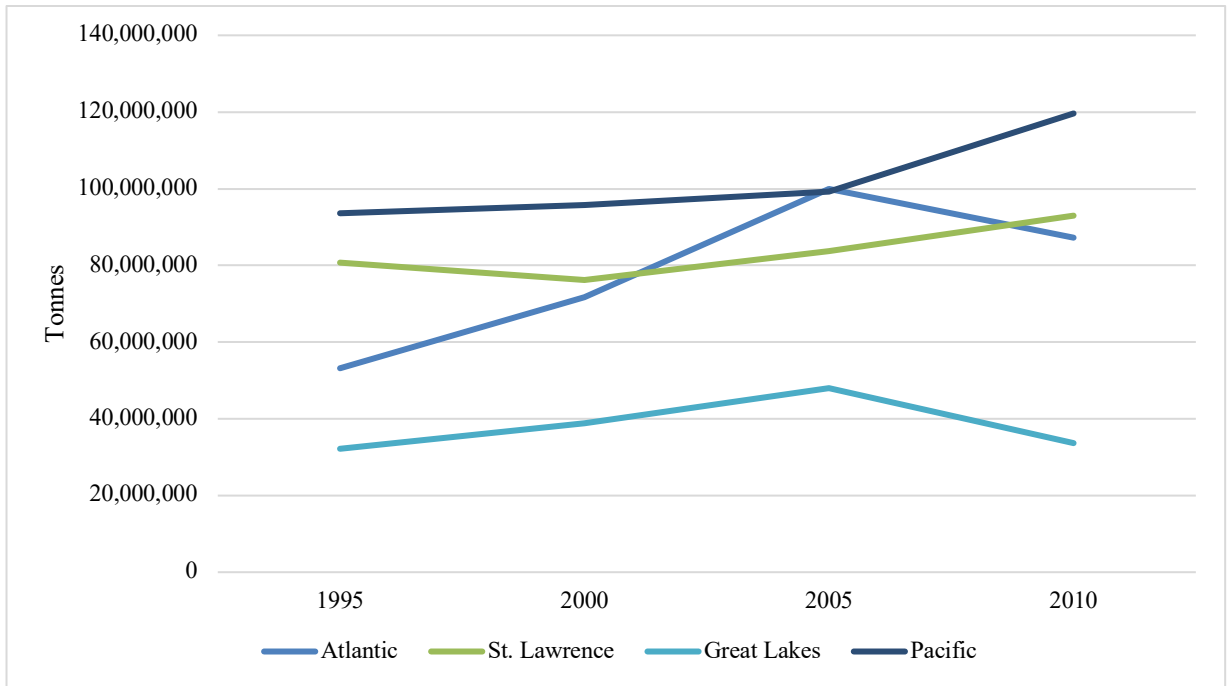


Figure 5. Total commodities by region

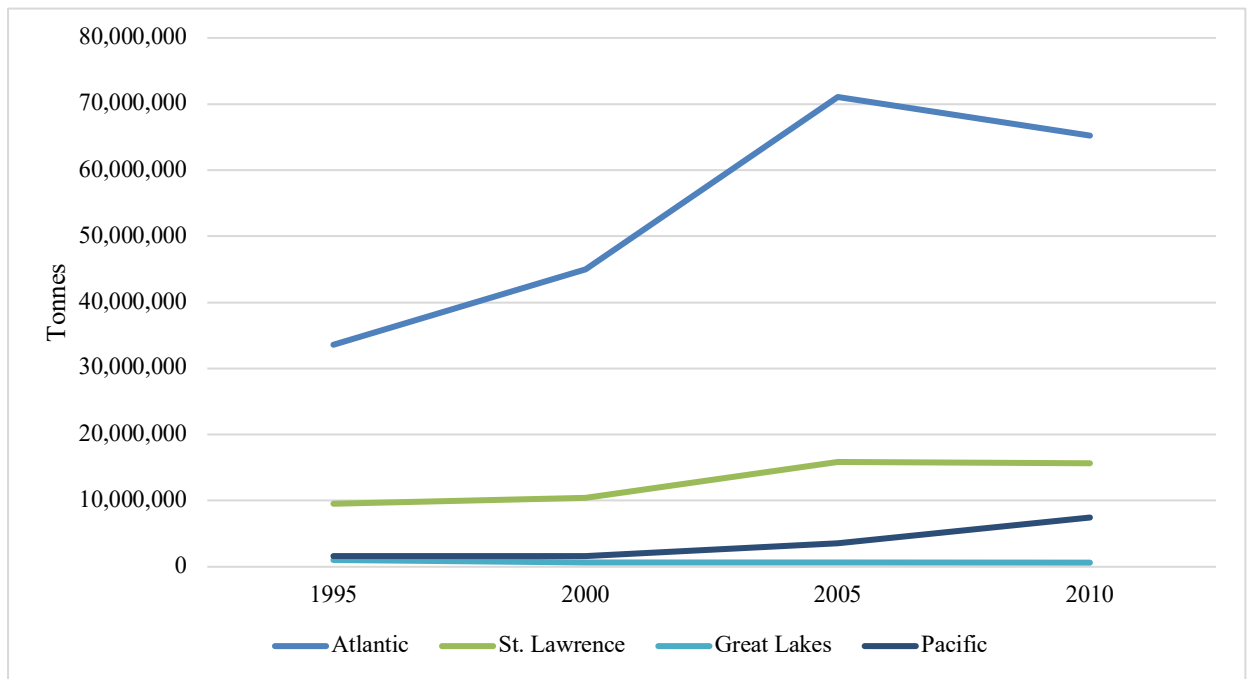


Figure 6. Crude petroleum, fuel oil and gasoline by region.

Shipping in Canada varies by region, including traffic (number of vessel and type of vessels) and amount of crude oil and petroleum products transported. The East Coast annually sees twenty thousand inbound vessels, one fifth of which are tankers (TC, 2020b). Over eighty-two million tonnes of petroleum and fuel products move through the twenty-three Atlantic Canadian ports (TC, 2020b). Quebec alone has twenty-five million tonnes of petroleum and fuel products moved through thirty-nine ports (TC, 2020b). The West Coast annually sees almost two-hundred thousand departures and arrivals, less than one percent of which are tankers (TC, 2020b). Based on these numbers, the West Coast has roughly five times the traffic as the East Coast, but a smaller percentage are tankers. These regional differences will impact the probability, and overall risk, of a marine oil spill.

CHAPTER 3: TANKER SAFETY EXPERT PANEL

3.1. Introduction to the TSEP

The Tanker Safety Expert Panel (TSEP) was established in 2013 to review the current Ship-source Oil Spill Preparedness and Response Regime on behalf of the Minister of Transport (TC, 2020f). The TSEP is chaired by Captain Gordon Houston, and includes Richard Gaudreau and Michael Sinclair (TC, 2020f). The panel conducted engagement sessions with various entities such as industry stakeholders, response organization representatives, and government officials (TSEP, 2013). The panel released reports in 2013 and 2014 (respectively): “A Review of Canada’s Ship-source Oil Spill Preparedness and Response Regime – Setting the Course for the Future” and “A Review of Canada’s Ship-source Spill Preparedness and Response: Setting the Course for the Future, Phase II – Requirements for the Arctic and for Hazardous and Noxious Substances Nationally” (2013). This study only reviewed the first report.

Overall, the TSEP found that Canada’s preparedness and response are “fundamentally sound” for oil spills south of 60°N (TSEP, 2013). However, there is opportunity for improvement (TSEP, 2013). The TSEP recommendations were based on five key assumptions:

- “Spill planning and the response resources allocated to prepare for spills should be based on risks to a geographic area”,
- “Potential polluters should be prepared, through their contracted Response Organizations, to arrange a response to a worst-case scenario through cascading resources and mutual assistance agreements that supplement a response organization’s risk-based response capacity”,
- “A timely response to a spill is a key factor in mitigating its effects”
- “Response planning should be focused on whatever strategies are identified for a geographic area that will most effectively limit the environmental, socio-economic impacts of a spill”, and
- “Canadian taxpayers should not bear any liability for spills in Canadian waters.” (TSEP, 2013, p. 1).

The report gives 45 recommendations to improve Canada’s overall preparedness and response (TSEP, 2013). A complete list of TSEP recommendations is available in Appendix A.

3.2. Key Findings

The TSEP found that the preventative measures in place are effective; there have been no major oil spills since the implementation of the NPP (TSEP, 2013). However, there are opportunities for improvement as the current structure does not take into consideration the different risks that exist between geographic regions (TSEP, 2013). TSEP recommends that oil spill preparedness and response “should be based on risk”, “identified and mitigated and at a regional level”, and believes that “one-size-fits-all standards” are inappropriate for a country such as Canada, which encompasses varied geography, industries, and environments (TSEP, 2013, p. 9). An area response planning model, presented in Figure 7, was suggested.

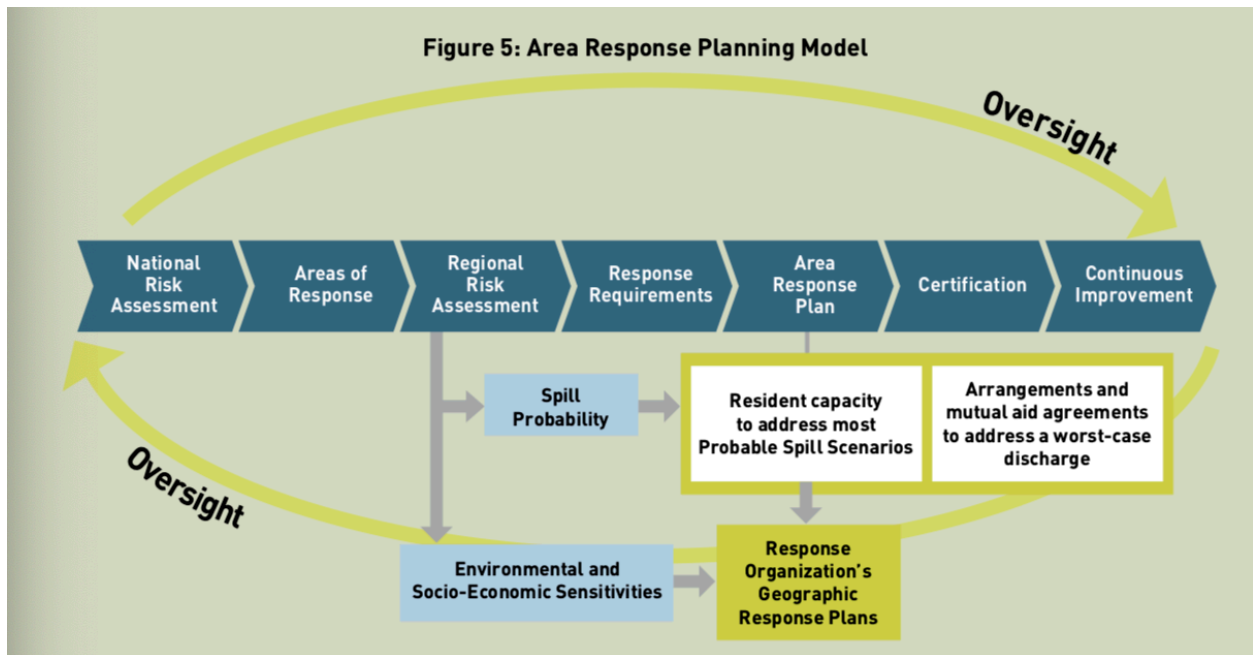


Figure 7. The Tanker Safety Expert Panel presented an Area Response Planning Model to identify and mitigate risks on a regional level (TSEP, 2013, p. 16).

3.3. Implementation Status of Recommendations

Of the 45 recommendations made by the TSEP, 20 relate directly or indirectly to the line of inquiry: *Is the current regime (which is standardized across the country, with all actors operating under the same regulations and guidelines) an appropriate model for Canada? How can it be improved?* Since the 2013 review, the Area Response Planning pilot project aimed to address some of the TSEP recommendations (Figure 8). Of these 20 recommendations, three have been addressed or are in the process of being addressed (Yes), three have not been addressed (No), ten have been partially addressed (Partially), and four do not have information available (Unknown). Table 3 (next page) explains the status of each recommendation, and the implications for an RRP framework.

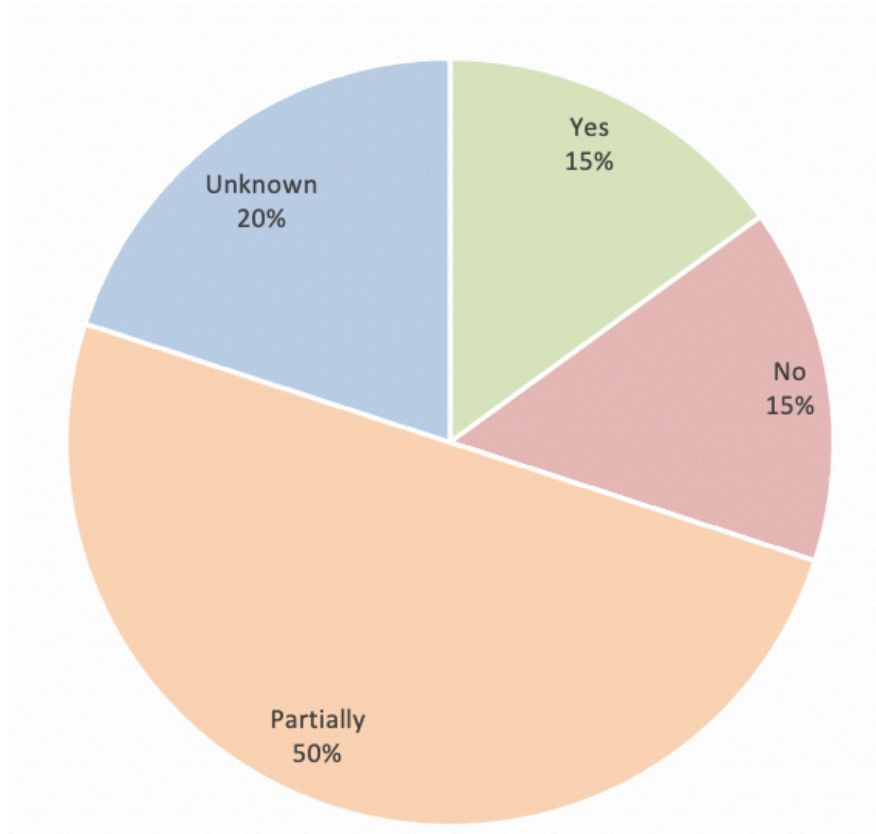


Figure 8. The implementation status of the 20 relevant TSEP recommendations.

Table 3. List of TSEP Recommendations that directly relate to RRP, current status of these recommendations, and implications for an RRP framework. Colour coded to reflect if (Y) Yes, the recommendation has been met, or is in the process of being met; (N) No, the recommendation has not been met; (P) The recommendation has partially been met; or (U) Current status is unknown, or data is unavailable.

| Met | # | Recommendation | Implementation | Implication for RRP |
|-----|----|--|---|---|
| N | 6 | “Transport Canada, in collaboration with the Canadian Coast Guard, Environment Canada and Response Organizations, should develop a standardized process for risk-based Area Response Planning.” (TSEP, 2013, p. 19) | Lessons Learned from the ARP indicated there was not standardization between pilot areas. | A standard process that can be applied to any region in Canada, should be developed. The deliverable of this study is a suggested framework. |
| N | 10 | “Transport Canada should require Response Organizations to develop detailed Geographic Response Plans to minimize potential spill impacts to key environmental and socio- economic sensitivities. These Geographic Response Plans should include specific time standards and identify the response resources that would be maintained locally.” (TSEP, 2013, p. 22). | Not required by the Response Organization Regulations (last updated in 2019). (JC, 2019c) | Preparedness and response standards should not be uniform across the nation, rather they should be based on regional risk and sensitivities. This recommendation is included within Phase 5: Respond. |
| N | 37 | “The Government should disband the Regional Advisory Councils.” (TSEP, 2013, p. 41) | There is no evidence suggesting the RACs have been disbanded. | While this recommendation is applicable to regional management, it will not be integrated into the framework developed in this study. |
| P | 2 | “The Government of Canada should implement a risk-based Area Response Planning model to prepare for ship-source oil spills.” (TSEP, 2013, p. 16). | The Area Response Planning Initiative (2014-2017) provided a model for risk-based ship-source oil spills (TC, 2019b). | Similar to recommendation 6, a risk-based ARP model needs to be implemented. The framework developed by this study is a suggestion. |

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| P | 4 | “Transport Canada should designate new Areas of Response, based on the national Risk Assessment for Marine Spills in Canadian Waters.” (TSEP, 2013, p. 17). | The ARA Methodology identified vulnerable areas in Canada, which could then be designated as new Areas of Response (DCL, 2017). The WSP report for TC assessed risk for marine spills in Canada. | Using the ARA methodology by DLC, TC should identify areas of priority to implement RRP. This recommendation is included in Phase 0: Initiation. |
| P | 5 | “Using a consistent methodology, Transport Canada should perform regional risk assessments for each Area of Response and make the results public.” (TSEP, 2013, p. 18). | Dillon Consulting Limited produced ARA Methodology (DCL, 2017), “Transport Canada led the development of an area risk assessment methodology and tested it in the four pilot areas.” (TC, 2019b). A regional risk assessment was conducted in northern BC, but not each area of response (TC, 2020d). | Similar to recommendation 4, TC should use the ARA methodology by DLC, and conduct risk assessments for all areas of response. This recommendation is included in Phase 0: Initiation. |
| P | 8 | “The Canadian Coast Guard should invite other stakeholders who are involved in oil spill preparedness and response to participate during the planning process. The Area Response Plans should be made publicly available.” (TSEP, 2013, p. 20) | TC has hosted almost 900 engagement sessions, 600 of which were with Indigenous groups (TC, 2020d). | Stakeholder engagement has been identified as a guiding principle of the RRP framework. Stakeholder engagement is emphasized in Phases 1-3, but is encouraged at all phases. |
| P | 11 | “Transport Canada should certify Response Organizations based on their Area Response Plans and Geographic Response Plans, which may include the use of alternative response techniques.” (TSEP, 2013, p. 23). | Although ARP and GRS are not required by the Response Organization Regulations (last updated in 2019), the WCMRC website says ROs “are required to have area-specific response plans” (JC, 2019c; WCMRC, 2020) and there are projects under the OPP that are exploring alternative spill response measures (TC, 2020d). | While this recommendation is applicable to RRP, the development of this framework did not consider changing the certification requirements of the ROs. |

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| P | 13 | “The Government of Canada, in consultation with the provinces and territories, should develop a strategy for the timely disposal of oily waste, and incorporate the results of this strategy into the Area Response Planning model.” (TSEP, 2013, p. 24). | There are projects being funded under the OPP, including looking at oily waste disposal (TC, 2020d). | This recommendation is included in Phase 5: Respond. |
| P | 14 | “Environment Canada and Fisheries and Oceans Canada should develop and implement a strategy to provide aid to wildlife and incorporate the results of this strategy into the Area Response Planning model.” (TSEP, 2013, p. 24). | Data was collected in northern BC to understand habitat use and threats (TC, 2020d). | This recommendation is included in both Phase 1: Region (identifying wildlife in the area that would be at risk in the event of a spill) and Phase 5: Respond (strategy to provide aid to wildlife). |
| P | 15 | “The Area Response Planning model should include requirements for a multi-jurisdictional exercise program for each Area of Response. Regular exercises should be conducted in each Area of Response to test specific components of the Area Response Plans.” (TSEP, 2013, p. 25). | The ROs conduct regular exercises within their areas of response, but there is no mention of testing specific ARP components. | This recommendation is included in Phase 4: Prepare. |
| P | 31 | “Environment Canada should strengthen its commitment to providing leadership in scientific and environmental advice related to spill preparedness activities, through active and sustained participation in Area Response Planning at the regional level, and with Fisheries and Oceans Canada as a source of scientific advice.” (TSEP, 2013, p. 37). | “Fisheries and Oceans Canada and Environment and Climate Change Canada contributed scientific information, including data on physical, biological and socio-economic sensitivities.” (TC, 2019b) | Within Phase 0: Initiation, the roles and responsibilities of DFO and ECCC will include providing scientific and environmental advice. Then, in Phase 1: Region, these departments will provide scientific and environmental expertise. |
| P | 41 | “Environment Canada, in collaboration with Fisheries and Oceans Canada, | “Fisheries and Oceans Canada and Environment and Climate Change | As with recommendation 31, the role and responsibility of DFO |

| | | | | |
|---|----|---|---|---|
| | | should collect and collate environmental sensitivity information for each Area of Response and make this information publicly available.” (TSEP, 2013, p. 44) | Canada contributed scientific information, including data on physical, biological and socio-economic sensitivities.” (TC, 2019b) | will include providing scientific and environmental advice. In Phase 1: Region, DFO will collect and provide will provide scientific and environmental expertise to identify sensitivities in the region. |
| Y | 7 | “The Canadian Coast Guard should lead the Area Response Planning process for each Area of Response with Transport Canada, Environment Canada and the Response Organizations operating within in.” (TSEP, 2013, p. 20) | “The Canadian Coast Guard led the development of the planning process for risk-based response plans in the four pilot areas.” (TC, 2019b) | Within Phase 0: Initiation, roles and responsibilities of involved government agencies will be clearly outlined. |
| Y | 19 | “The Government should properly resource the Canadian Coast Guard to lead planning in the Area Response Planning process.” (TSEP, 2013, p. 25). | “The Canadian Coast Guard led the development of the planning process for risk-based response plans in the four pilot areas.” (TC, 2018b) | Within Phase 0: Initiation, the role and responsibility of the CCG will include taking a leadership role. |
| Y | 21 | “The Canadian Coast Guard should be the final authority to approve the use of spill treating agents and other alternative response techniques and should be supported by a standardized process taking into account the net environmental benefit concept, as an element of the Area Response Planning process.” (TSEP, 2013, p. 27). | The OPP amended the CSA, 2001 and the MLA to “strengthen the Canadian Coast Guard’s authorities to support a more proactive, quick, and effective response to ship-source pollution incidents” (TC, 2020d). | Prepare (develop standards for the ROs) and Respond (have final say) |
| U | 9 | “The Canadian Coast Guard should ensure the Area Response Plans identify the resident capacity (e.g., equipment, personnel, management systems) required to address all Probable Spill Scenarios in the Area of Response. The plans should also include all of the Response Organizations’ arrangements | No information was found regarding this recommendation. | This recommendation is included in Phase 5: Respond. |

| | | | | |
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| | | for cascading resources and mutual assistance agreements required to address a worst-case discharge.” (TSEP, 2013, p. 21) | | |
| U | 12 | “Transport Canada should be granted additional enforcement and oversight tools to ensure that Response Organizations meet the requirements outlined in their Area Response Plans.” (TSEP, 2013, p. 23). | No information was found regarding this recommendation. | This recommendation is included in Phase 6: Review. |
| U | 16 | “Transport Canada should collaborate with Response Organizations and other industry partners to determine the new costs associated with implementing the Area Response Planning model. All parties should then work together to develop a fee structure that will fund this new model.” (TSEP, 2013, p. 25). | No information was found regarding this recommendation. | Changes in the structure of funding are not included in this framework. |
| U | 17 | “The Government should ensure that Transport Canada has the appropriate resources and competencies to deliver risk assessments and risk advice in support of oil spill planning and preparedness.” (TSEP, 2013, p. 25). | No information was found regarding this recommendation. | This recommendation is included in Phase 2: Risks. |

CHAPTER 4: AREA RISK ASSESSMENT

4.1. Overview

Transport Canada has used two consulting companies to assess risk of ship-source oil spills in Canadian waters, WSP Canada Inc. (WSP) in 2014 and Dillon Consulting Limited (DCL) in 2017.

The report titled “Risk Assessment for Marine Spills in Canadian Waters, Phase 1: Oil Spills South of 60th Parallel” was published in 2014 by WSP. This report was conducted in response to the Commissioner of the Environment and Sustainable Development’s (CSED) audit of oil spill response. The CSED’s report highlighted the lack of standardization in risk assessment between government agencies (WSP, 2014). The report titled “Area Risk Assessment Methodology Development for Ship-source Oil Spills in Canadian Waters – Guidance Document” was published in 2017 by Dillon Consulting Ltd. This report provided ARA methodology to Transport Canada to determine locations and volumes of probable spills (DCL, 2017). These documents address recommendations 4 and 5 from the TSEP:

Recommendation 4: “Transport Canada should designate new Areas of Response, based on the national Risk Assessment for Marine Spills in Canadian Waters.” (TSEP, 2013, p. 17).

Recommendation 5: “Using a consistent methodology, Transport Canada should perform regional risk assessments for each Area of Response and make the results public.” (TSEP, 2013, p. 18).

4.2. WSP Assessment

WSP conducted a Canada-wide assessment, including the territorial seas, the contiguous zone, the exclusive economic zone, internal and inland waters. Oil was classified as crude oil, refined oil or fuel. Because of the large scale at which this study was conducted, the detail at which oil spill risks are described is limited (WSP, 2014). Weather was not considered as a risk

factor. Response actions and preventative measures were not considered (i.e. risk was based off a “worst-case” scenario).

Traffic data, oil volumes and spill frequencies were calculated using Lloyd’s worldwide data (WSP, 2014). Spill risk was calculated using 10-year history of marine traffic, commodity movement data (for crude and refined oil, and fuel), and the CCG Incident Database for spills in Canadian waters (WSP, 2014).

Methods: WSP began their risk assessment study by creating zones. Canadian waters were divided into sectors (Pacific, Atlantic, Estuary/Gulf of St. Lawrence, and the Great Lakes), then sub-sectors, divided by environment (nearshore, intermediate, and deep-sea). In total, there were 77 zones identified. Overall Environmental Risk Index (ERI) was assessed for each zone using parameters such as Environmental Sensitivity Index (ESI), Ecologically and Biologically Significant Areas (EBSAs), Biological Resource Indicator (BRI), Physical Sensitivity Index (PSI), and Human-Use Resource Index (HRI) (WSP, 2014).

4.3. DLC Assessment

DLC has identified areas that are of higher potential risk due to the existing regional conditions (geography, environmental sensitivities, ship volumes), and provided methodology to assess risk, which can be used as vessel traffic increases (DCL, 2017). DCL defined risk as *frequency x consequences* of a ship-source spill (DCL, 2017). This was addressed in three components: risk identification, risk analysis, and risk evaluation. The resulting model predicts location, frequency and volume of oil spills. This methodology is applicable south of 60°N.

Methods: DLC used statistics of oil spills as well as the BowTie method to identify threats and consequences (Figure 9).

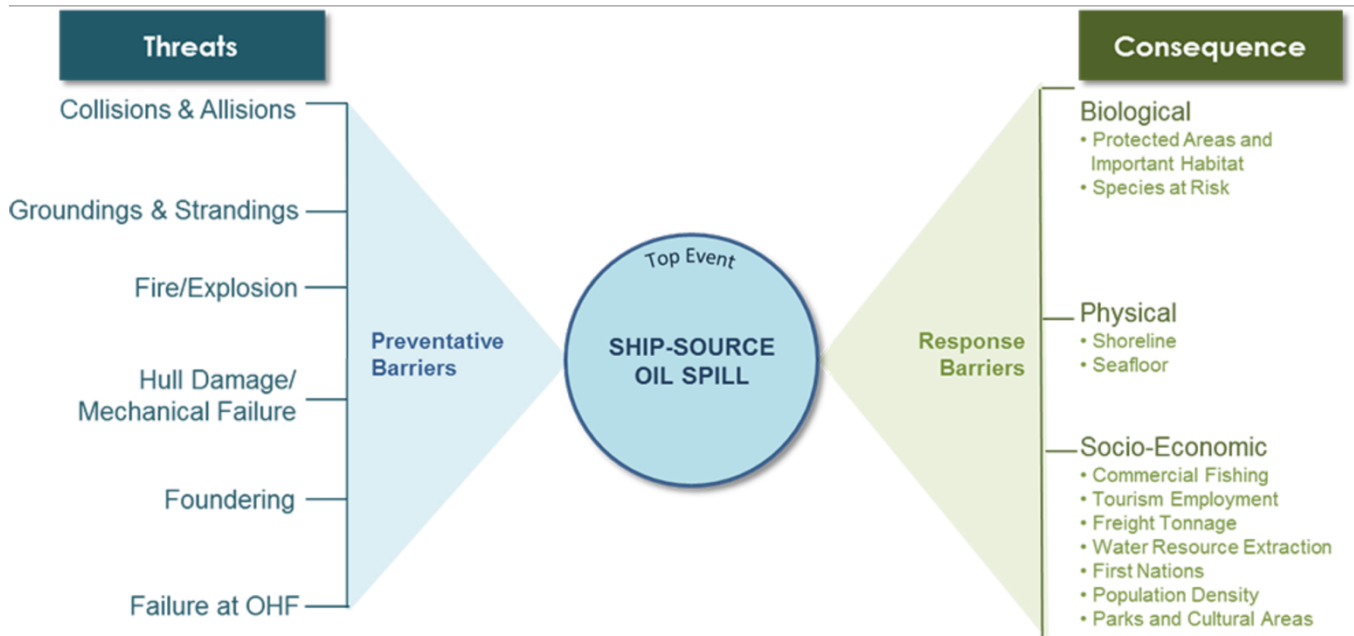


Figure 9. BowTie diagram identifying threats and consequences of a ship-source oil spill (DLC, 2017).

DLC collaborated with TC, DFO, ECCC, provincial governments and the ROs, and conducted public engagement sessions with communities in the four assessment areas (DLC, 2017). After determining which areas were at risk of a spill (frequency), DLC used trajectory models to determine the impacts of a spill in that region (consequences).

4.4. Results

The WSP (2014) data produced a map, included below (Figure 10), illustrating the overall Environmental Risk Index (ERI) of an oil spill. Maps were also produced specifically for crude oil, and refined products. ERI was calculated using the Environmental Sensitivity Index (ESI) and the probability of a spill, and scores range from very low to very high. Note: southern British Columbia, and the Saint Lawrence River both scored very high. These two regions were selected for the ARP pilot project. There are also high ERI regions surrounding Nova Scotia and Newfoundland.



Figure 10. Map showing overall Environmental Risk Index (ERI) for marine oil spills in Canadian waters south of the 60th parallel (WSP, 2014). The relative scale goes from light yellow as very low ERI, to red as very high ERI.

The results of this study indicate the probability of a spill varies greatly between regions (WSP, 2014). This supports the case for a regional, risk-based management plan. In the Executive Summary, WSP stated, “These results demonstrate the need for Canada to tailor its preparedness efforts for each sector of the country, as the risks across the country are demonstrably different” (WSP, 2014, p. iii).

The result of the DLC project was a risk assessment methodology (Figure 11) that can be applied across Canada to inform the government and stakeholders, and ensure decisions are backed by science. This information will allow spill prevention measures to be implemented.

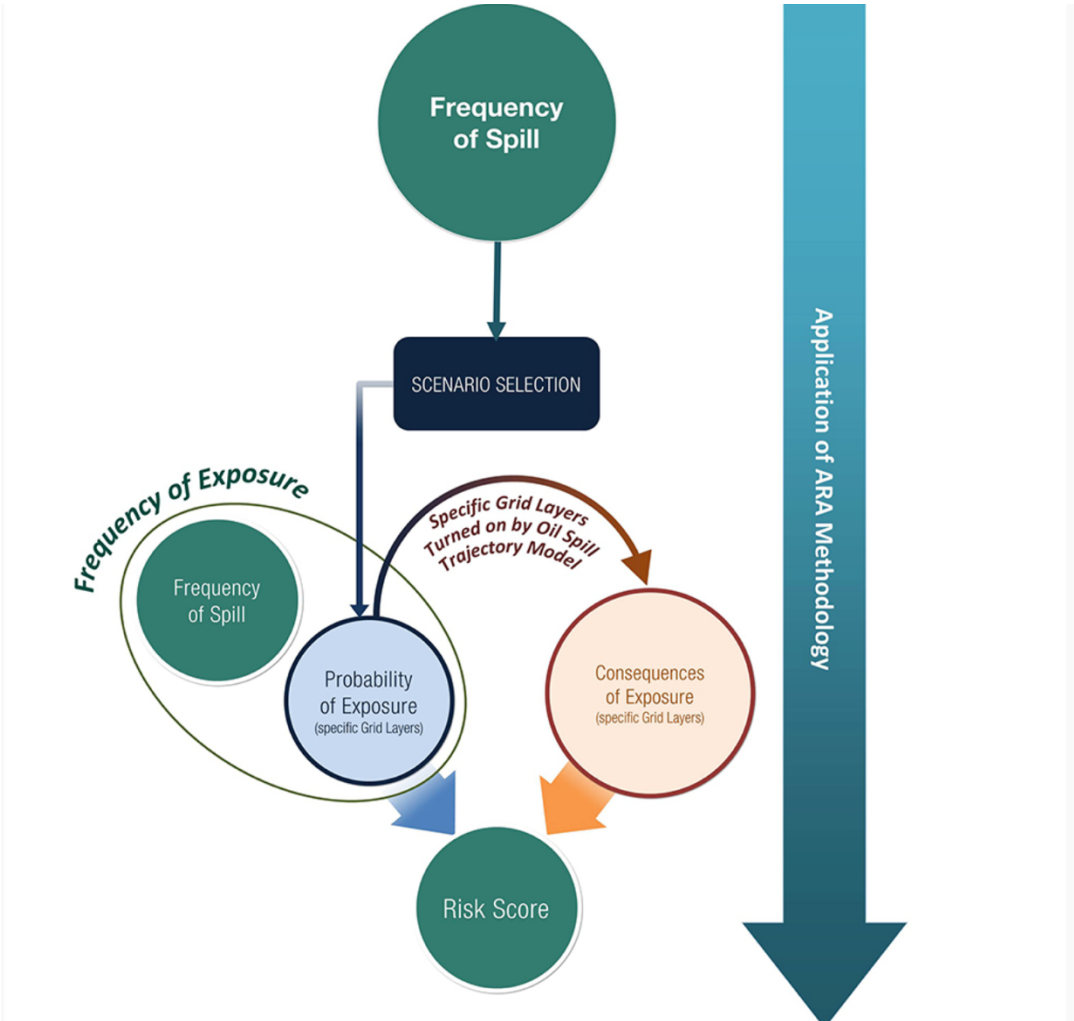


Figure 11. Illustration of the development and application of the Area Risk Assessment methodology (DLC, 2017).

CHAPTER 5: AREA RESPONSE PLANNING

5.1. Overview

Timeline: The Area Response Planning (ARP) pilot project, also called the Area Response Planning Initiative (ARPI), ran from 2014 to 2017. Following the completion of the project, an ARP Final Evaluation workshop was held 30 May to 1 June 2017. An ARP Lessons Learned Workshop was held 15-17 August 2017. A Regional Risk Assessment and Regional Response Planning project followed the ARP project.

Purpose: The ARP project was initiated under the Oceans Protection Plan to identify recommendations for the development of a Regional Response Planning (RRP) management strategy (TC, 2018; TC, 2019c). The purpose was to allow flexibility in a response plan to take into consideration regional differences in geography and risk (TC, 2019c). Creating regional plans also allows for engagement with local stakeholders. Communities, Indigenous groups, industry partners, and government agencies (federal, provincial and municipal) were invited to participate in the ARP plan development (TC, 2019c). This project was prompted by recommendations from the TSEP, which suggested shifting Canada's NPP away from a "one size fits all" framework to a regional, risk-based approach (TC, 2019c). This project was led by TC and the CCG (TC, 2018). Some benefits of ARP include:

- Improved engagement with stakeholders, coastal communities, and Indigenous nations;
- Integration of local management and planning mechanisms; and
- Based on local risks and conditions (biological, physical, socioeconomic) (TC, 2018).

Scope: The ARP project focused on four regions: Southern British Columbia; the St. Lawrence, from Montreal to Anticosti Island; the Bay of Fundy and Saint John; and Port Hawkesbury and the Strait of Canso (TC, 2018). These areas were selected because of their level of vessel traffic and the area of response of the four TC certified Response Organizations (ROs) (TC, 2018).

Figure 12 (next page) shows the geographic scope of the four case studies and identifies regional ports.

The ARP included vessels as dictated in the CSA, 2001:

- “Oil tankers of 150 gross tonnage or greater;
- Vessels of 400 gross tonnage or more that carries oil as cargo or fuel;
- Groups of vessels, towed or pushed, 150 gross tonnage or more in aggregate and carry oil as cargo; and
- Oil Handling Facilities when engaged in loading or unloading operations with a prescribed vessel.” (TC, 2019c)

Roles: Representatives from TC, DFO, CCG, ECCC, industry, and provincial departments formed Regional Task Forces. Transport Canada led development of Area Risk Assessment methodology with support from the Regional Task Force. The Coast Guard led development of Area Response Planning methodology with support from the Regional Task Force. Fisheries and Oceans Canada and Environment and Climate Change Canada provided scientific expertise on physical, biological and socioeconomic sensitivities in the regions. Working groups were formed to facilitate discussion on topics such as data management and stakeholder engagement (TC, 2019c).

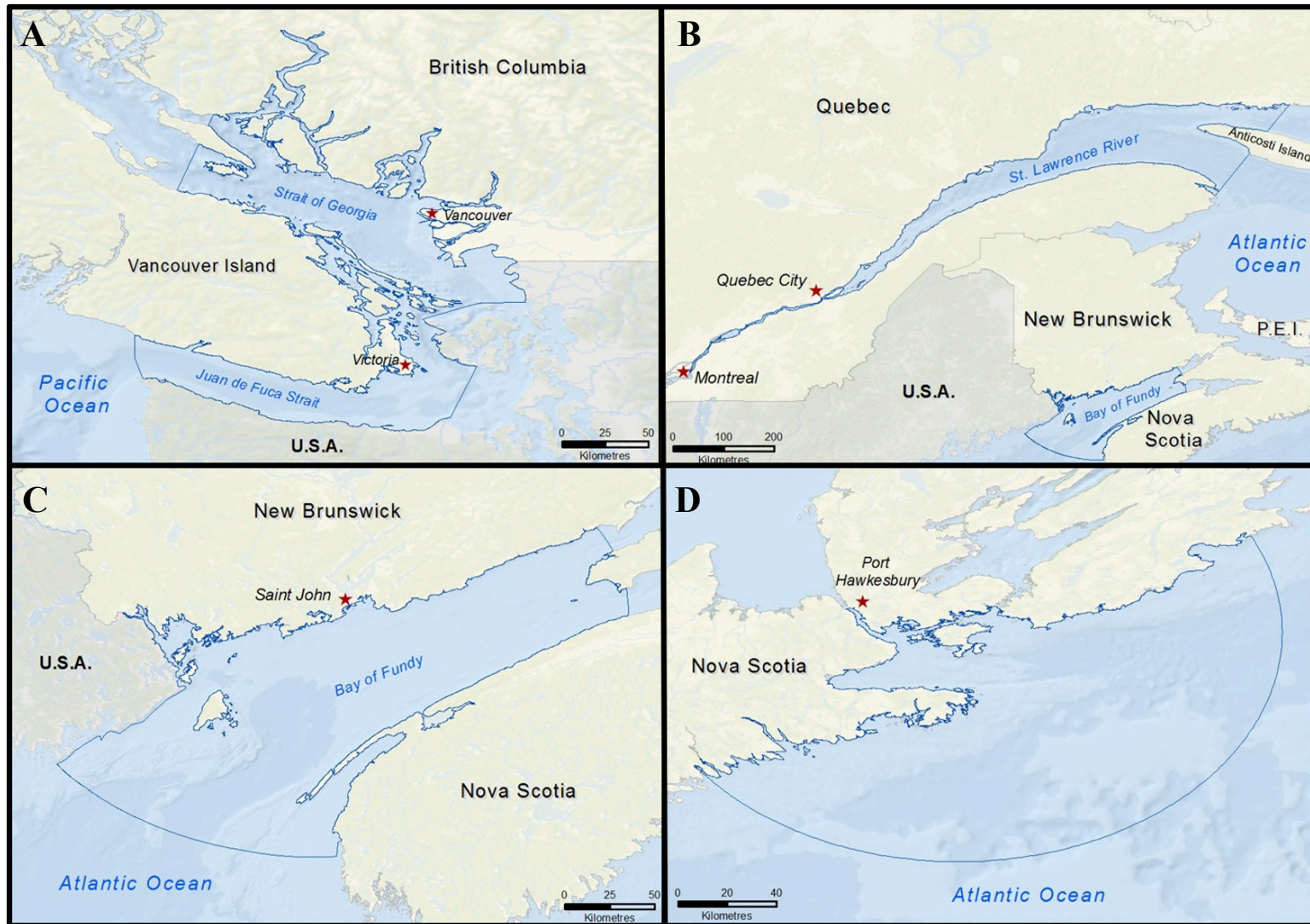


Figure 12. This figure shows the geographic area (identified by a thin blue line) included in the four case studies of the Area Response Planning pilot project, adapted from TC (2018). The four areas are (A) Southern British Columbia, (B) the St. Lawrence (from Montreal to Anticosti Island), (C) the Bay of Fundy and (D) Port Hawkesbury (the Strait of Canso). Major ports in each region are identified by a red star.

5.2. Successes and Shortcomings

A number of TSEP recommendations were partially or completely implemented. The project continued into an ARA and RRP project in the southern British Columbia region (TC, 2019c). TC concluded that this project enhanced the preparedness of federal agencies to respond to a marine oil spill. DFO has established emergency response capabilities in regions across Canada, data sharing and integration have increased between federal agencies, and responsibilities of agencies are better understood (TC, 2019c). Additionally, working relationships between federal agencies and the four ROs have improved (TC, 2019c). Establishment of contribution agreements enhance the agencies' ability to gather, organize and share environmental data, which allows for better decision-making following a spill (TC, 2019c). Engagement with Indigenous communities and the fishing industry have provided a more complete understanding of environmental sensitivities. Overall, these successes have provided a solid foundation for RRP to be developed and implemented at a national scale.

5.3. Recommendations

Following the ARP Pilot Project, a number of recommendations were identified (TC, 2018). These recommendations fell into six categories:

1. Risk Assessment;
2. Sensitivity data collection, standardization and integration;
3. Building risk-based response plans;
4. Regime and policy implications;
5. Engagement and communications; and
6. Governance and collaboration across agencies – defining roles and responsibilities (TC, 2018).

Following the RRP project in British Columbia, two recommendations were given:

- “Align area response planning boundaries within BC by designating geographic sub-regions within the province, and create a multi-jurisdictional governing body (inclusive of local and First Nations governments) to oversee area response planning within each geographic region.” (Nuka, 2016)
- “Establish Regional Community Advisory Councils within each geographic region, based on the Alaska/Sullum Voe model, and provide them with a governance role in area response planning.” (Nuka, 2016)

A list of all the recommendations are included in Appendix B, as well as implementation status. However, there is very limited data available, and the state of many of the recommendations’ implementation statuses are unknown.

CHAPTER 6: RECOMMENDED FRAMEWORK FOR RRP

TSEP and TC (DCL and WSP) methods and recommendations were utilized to create a standardized integrated and adaptive management framework for an RRP approach to marine oil spills in Canada. This novel framework is composed of six phases. It does not address any recommendations regarding changes to the structure of the liability and compensation aspect of the oil spill response regime. This framework allows for regionally tailored preparedness and response, while remaining standardized as part of a national approach to marine oil spills. This framework is directly linked to the TSEP recommendations: “The Government of Canada should implement a risk-based Area Response Planning model to prepare for ship-source oil spills.” (TSEP, 2013, p. 16); and “Transport Canada, in collaboration with the Canadian Coast Guard, Environment Canada and Response Organizations, should develop a standardized process for risk-based Area Response Planning.” (TSEP, 2013, p. 19). Additional TSEP recommendations and lessons learned from the ARP pilot project were integrated throughout the six phases.

As per the recommendation “Transport Canada should designate new Areas of Response, based on the national Risk Assessment for Marine Spills in Canadian Waters.” (TSEP, 2013, p. 17), this framework should be implemented in priority regions identified in the national ARA document. Overall, this framework should be carried out while focusing on two principles: stakeholder engagement and government coordination. These principles were not sufficiently emphasized in the ARP project. As such, the task force needs to engage with stakeholders throughout the entire process, but especially when identifying sensitivities and risks within the region. It is imperative that federal departments (ECCC, DFO, TC, CCG) collaborate, data-share, and communicate.

Figure 13 (next page) illustrates the framework that was developed in this study. Sections 7.1-7.6 explain the framework in detail, including methodologies at each stage, stakeholders and regulatory bodies involved, as well as TSEP recommendations implemented in each phase.

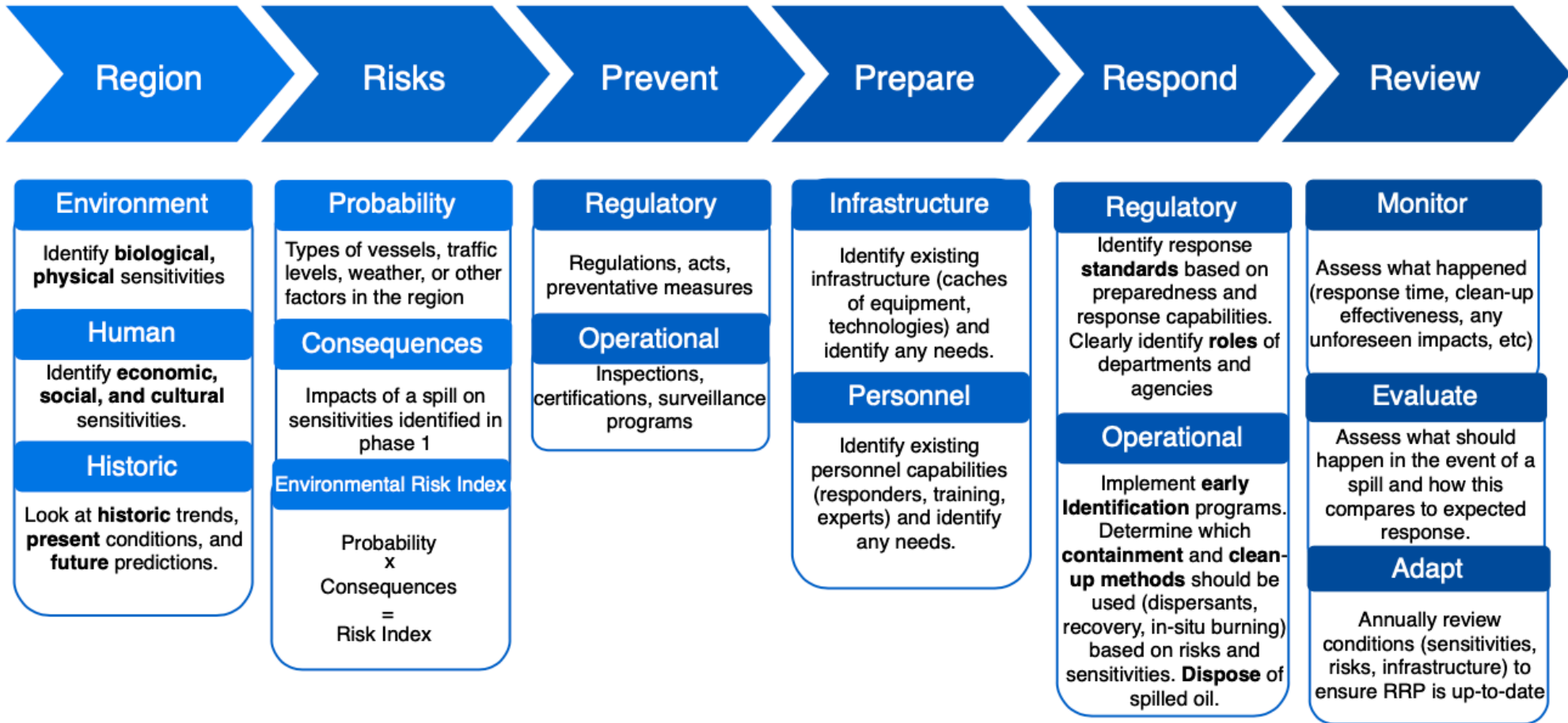


Figure 13. The Regional Response Planning framework developed by this study, implementing recommendations from the Tanker Safety Expert Panel and Area Response Planning initiative.

6.1. Phase 0: Initiate

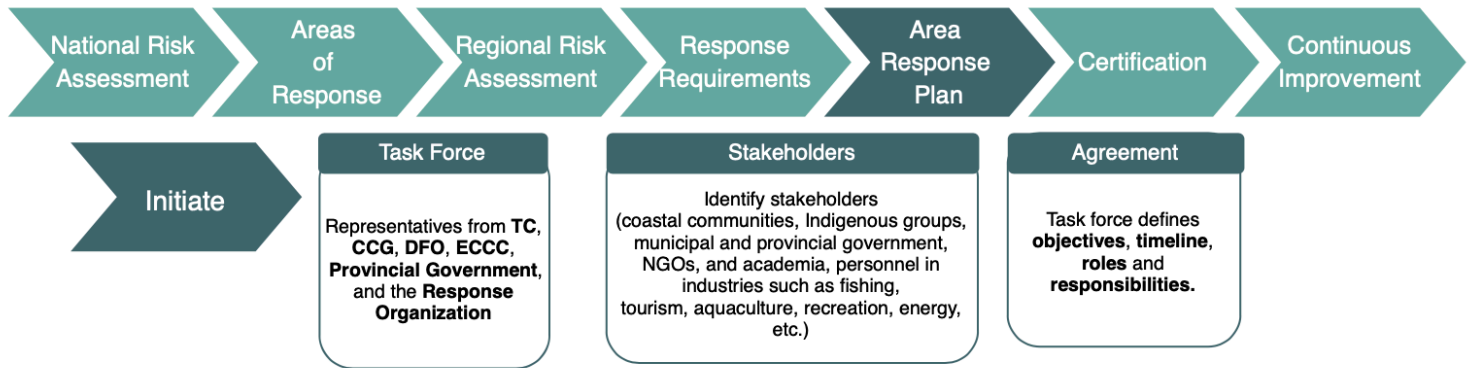


Figure 14. Diagram of the Initiation Phase – indicates where this regional response planning framework fits into the overarching national framework.

The Initiation Phase sets the stage for the remainder of the RRP project, and aims to foster trust and communication between the task force and stakeholders. Within this phase, there are three main components: Task Force, Stakeholders and Scope. The Initiation Phase is shown above in Figure 14. This Phase addresses two TSEP recommendations: “The Canadian Coast Guard should invite other stakeholders who are involved in oil spill preparedness and response to participate during the planning process. The Area Response Plans should be made publicly available.” (TSEP, 2013, p. 20) and “Due to the number and variety of subject matter experts involved, a common lexicon should be established at the outset of the ARA process” (TC, 2013)

Task Force: As with the ARP project, a task force will be established at the outset of this project. This would include representatives from TC, CCG, DFO, ECCC, the provincial government(s), and response organization(s).

Stakeholders: Next, primary, secondary and key stakeholders in the region are identified. This includes groups such as coastal communities, Indigenous peoples, municipal and provincial government departments, NGOs, academia, and industry professionals from fishing, aquaculture, tourism, and energy sectors.

Agreement: Finally, the task force will create a project initiation document that: clearly defines the project objectives; scientific, operational and regulatory roles and responsibilities; sets a

timeline; and defines key terms. This document will also outline data sharing protocols, to ensure data are readily available.

6.2. Phase 1: Region

This phase focuses on understanding all aspects of the region for which the RRP is being developed. This phase utilizes scientific expertise and local knowledge to identify sensitivities in the region. Sensitivities encompass any characteristic that increases the region's risk of oil spill, or would heighten the consequences of an oil spill. Three sub-components are studied in this phase: Environment, Human and History. The government agencies (TC, CCG, DFO, ECCC) will collaborate with each other, as well as with subject-matter experts, Indigenous peoples, coastal communities, fishing industry, NGOs, and any other identified stakeholders. Two TSEP recommendations answered in this phase are: "Environment Canada should strengthen its commitment to providing leadership in scientific and environmental advice related to spill preparedness activities, through active and sustained participation in Area Response Planning at the regional level, and with Fisheries and Oceans Canada as a source of scientific advice." (TSEP, 2013, p. 37) and "Environment Canada, in collaboration with Fisheries and Oceans Canada, should collect and collate environmental sensitivity information for each Area of Response and make this information publicly available." (TSEP, 2013, p. 44).

Environment: This sub-component identifies regional biological and physical sensitivities. This may include topics such as species-at-risk, protected areas, physical processes, and coastline types. Proactively identifying regional species and wildlife, as well as specific locations of critical habitat, ensures efficient aid can be provided to wildlife in Phase 5: Respond. Departments such as DFO and ECCC should provide expertise and ensure data is accessible throughout this phase.

Human: This sub-component identifies social, economic and cultural sensitivities in the region. This may involve identifying at-risk communities and industries in the region (fisheries, aquaculture, tourism) that would be impacted by a spill. This component will also identify Indigenous peoples and rights-holders in the region. Tools such as a stakeholder analysis or interest-influence matrix would assist the task force in identifying community members and

ensuring those with limited power have their voices heard. It is local communities and stakeholders who are most significantly impacted by spills (i.e. damage to property, health risks, loss of food sources, and detrimental impacts on local economies).

History: This sub-component identifies regional trends. By reviewing historical data of shipping (number of movements, type of vessels, amount of oil), and incidents (where, when, type of vessel, factors), the task force will be able identify trends (i.e. shipping increases). While the ARP project only used one year of data, ideal regional assessment would include at least ten years of data. Historical trends can be used to predict risk factors and conditions that increase incidence of spills; these trends can then be incorporated into oil spill prevention strategies.

6.3. Phase 2: Risks

The second phase focuses on understanding the likelihood and consequences of a spill in the region for which the RRP is being developed. This phase utilizes risk assessment methodology from two consultant firms, DLC and WSP. The risk assessment methodology for marine oil spills in Canada took into consideration navigational hazards, vessel movements and key sensitivities to determine the level of risk in each region. It then established “Probable Spill Scenarios” that could occur in each region, and identified sites where the highest environmental, economic, and social impacts could occur.

This phase addresses two TSEP recommendations: “Using a consistent methodology, Transport Canada should perform regional risk assessments for each Area of Response and make the results public.” (TSEP, 2013, p. 18) and “The Government should ensure that Transport Canada has the appropriate resources and competencies to deliver risk assessments and risk advice in support of oil spill planning and preparedness.” (TSEP, 2013, p. 25). During this phase, TC and the Task Force will measure and assess risk, so that it can be mitigated in the next phase.

There are two sub-components studied in this phase: Probability and Consequences. The task force will use risk assessment methodology to calculate the ERI for the region.

Probability: This sub-component measures the probability of a spill in the assessment area by looking at factors such as the number of transits in a region, volume of oil moved, and other factors such as ice or weather.

Consequences: This sub-component measures consequences of a spill, including modelling oil spill scenarios and trajectories. This sub-component considers the sensitivities identified in Phase 1: Region.

Environmental Risk Index is calculated as the product of probability and consequence. This is the main output of this phase. ERI values for the region can be mapped using low, moderate, high, or critical ratings. This map will assist task force in later phases by identifying areas within the region that may require additional spill response infrastructure. The Risk phase is critical, as the entire framework hinges on the ability to mitigate risk and prevent future spills.

6.4. Phase 3: Prevent

This phase identifies actions that can be taken to mitigate risks and to prevent ship-source oil spills. There are two sub-components: Regulatory and Operational.

Regulatory: As mentioned in the Introduction, there are over a hundred regulations, laws and agreements that make up Canada's marine safety plan. Ships are required to have a plan in case of a spill, as well as to "report where they're going, what they're carrying, and any issues with their navigation equipment" (TC, 2020g). In accordance with these regulations, double hulls are mandatory, reducing the risk of spills by ensuring ships remains water-tight even if the outer hull is damaged (TC, 2020b; TC, 2018d). Large vessels are required to have an automatic identification system (AIS) to provide updates on the vessel's position, speed, and course (TC, 2020i). Advanced Planning onboard vessels includes up-to-date charts and an oil pollution emergency plan (TC, 2020b).

Operational: In addition to regulatory measures, operational actions can be taken to minimize risk and prevent marine oil spills. Navigational aids such as buoys, markers, and lights are used to warn vessels of hazards and clearly mark shipping lanes (TC, 2020g; TC, 2020b). Tug escorts and marine pilots help vessels navigate challenging areas (busy waterways, hazardous regions,

harbours) (TC, 2020g; TC, 2020b). The CCG monitors ships travelling through Vessel Traffic Zones (VTZ) through the Marine Communication and Traffic Services (MCTS) (TC, 2020i). Marine inspectors annually inspect safety features such as emergency and communication systems, as well as the overall structure of the vessel (TC, 2020b). Ships travelling through Canadian waters are monitored through the National Aerial Surveillance Program (TC, 2020g). This keeps ships accountable in the event of a spill.

Prevention remains an integral component of any RRP framework. Thorough preventive measures minimize the likelihood of significant oil spills. Prevention also sets the stage for preparation, so that Canadian stakeholders are prepared to respond to marine oil spills.

6.5. Phase 4: Prepare

The Prepare Phase includes two key TSEP recommendations: “The Canadian Coast Guard should ensure the Area Response Plans identify the resident capacity (e.g., equipment, personnel, management systems) required to address all Probable Spill Scenarios in the Area of Response. The plans should also include all of the Response Organizations’ arrangements for cascading resources and mutual assistance agreements required to address a worst-case discharge.” (TSEP, 2013, p. 21), and “The Area Response Planning model should include requirements for a multi-jurisdictional exercise program for each Area of Response. Regular exercises should be conducted in each Area of Response to test specific components of the Area Response Plans.” (TSEP, 2013, p. 25). This phase is divided into two sub-components: Infrastructure and Personnel.

Regional preparation should be based on the local sensitivities and risks identified and calculated in Phase 1 and 2. Response Organization Regulations should require ROs to have adequate capabilities, equipment, and technologies for each region (i.e. standards should be based on regional risks, not uniform across the nation). This phase will take into consideration existing personnel and infrastructure, as well as regional needs (i.e. if a region lacks infrastructure or personnel). As outlined in the TSEP (2013) report, a RRP would “ensure that the proper governance and most appropriate equipment, personnel, training and procedures are in

place to respond to the most probable spill scenarios in a given geographic location and that response strategies are selected to mitigate the worst potential impacts.”

Infrastructure: Response Organizations have caches of response equipment stored in strategic locations. The locations of these existing caches should be compared to the ERI map to ensure they are in the most advantageous positions. If there are additional high-risk areas that require infrastructure, efforts should be made to increase response capacity in that region. Clean-up methods, such as booms or skimmers (physical containment), in-situ burning and dispersants, are identified for a geographic area to most effectively limit the environmental, economic, and social impacts of a spill (TSEP, 2013). Even in optimal conditions, mechanical recovery rates usually only recover between 5-15% of the oil spilled (TSEP, 2013). Thus, the method of clean-up must be chosen for an area based on the region’s specific conditions (i.e. shoreline type, weather, proximity to sensitive areas, remoteness), and the proper tools and technology should be made available.

Personnel: ROs should ensure they have adequate personnel to respond to spills in the region. There should be adequate training for personnel, including multi-jurisdictional training, as well as training for worst-case scenarios. Regional task forces should take inventory of local experts and stakeholders involved in spill response, and identify any gaps. Response organizations should work with local and remote communities to train community members.

6.6. Phase 5: Response

This phase primarily aims to address two TSEP recommendations: “The Government of Canada, in consultation with the provinces and territories, should develop a strategy for the timely disposal of oily waste, and incorporate the results of this strategy into the Area Response Planning model.” (TSEP, 2013, p. 24), and “Environment Canada and Fisheries and Oceans Canada should develop and implement a strategy to provide aid to wildlife and incorporate the results of this strategy into the Area Response Planning model.” (TSEP, 2013, p. 24). This phase is broken down into two sub-components: Regulatory and Operational. Within each of these sub-components, a few topics are addressed.

Regulatory: There are a number of regulatory, or administrative, aspects within the oil spill response procedure. Standards of response (timeline, quantity of oil recovered, disposal capabilities, etc.), and roles (lead agencies, response organizations, cascading resources, etc.) should be determined prior to a ship-source oil spill. For example, one TSEP recommendations indicated that ECCC and DFO should be the lead agencies in providing aid to oiled wildlife.

Operational: There are a number of operational aspects within the oil spill response procedure. These include early identification of spills, deployment of response personnel and equipment, clean-up, and disposal of oil. Aerial pollution patrols (through the National Aerial Surveillance Program) are used to detect and quantify oil spills (TC, 2020b; TC, 2020g). The patrols are high-resolution and able to locate spills as small as a litre. Programs such as these enable timely responses. Once a spill has been identified, one of the four TC certified response organizations will deploy personnel and equipment to contain, recover and dispose of the spilled oil (TC, 2020g). There are a number of clean-up methods can be used, such as booms, skimmers, dispersion or burning (TSEP, 2013). These different clean-up options have varying levels of success and are chosen based on the region in Phase 4: Prepare. Figure 15 illustrates these methods.

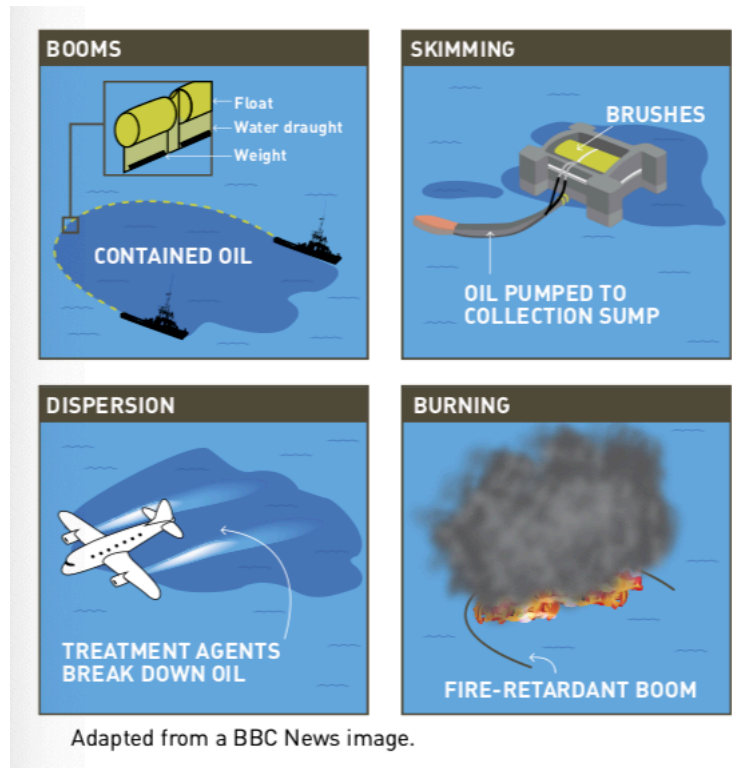


Figure 15. Illustration of four possible clean-up methods for marine oil spills: booms, skimming, dispersion, and burning (TSEP, 2013).

6.7. Phase 6: Review

The final component of the RRP framework is the Review Phase. This phase ensures the implemented management plan remains applicable to local conditions (i.e. changes in volume or

types of vessels, new industries, changes in species-at-risk statuses). This phase requires ongoing communication between the task force and stakeholders. Within this phase, there are three main components: Monitor, Evaluate and Adapt. The feedback loop aspect of the Review Phase is shown below in Figure 16.

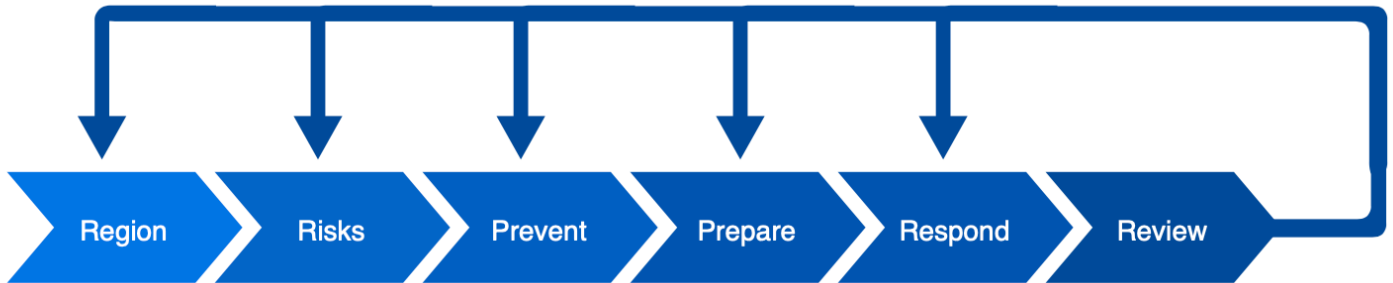


Figure 16. One important component of the Regional Response Planning framework is the use of a feedback loop in the Review Phase.

Monitor: The Monitor component assesses the response following a marine oil spill. This includes assessing factors such as response time, clean-up effectiveness and oil recovered, and any unforeseen impacts or complications. This is crucial to establishing the efficacy of the RRP, and will highlight any key areas to be improved.

Evaluate: Similar to the Monitor sub-component, the Evaluate component assesses the oil spill response. This phase will compare what was planned, or expected, and compare that to what occurred. This again will help improve the RRP by identifying any gaps (i.e. if the plan was supposed to improve communication, but communication barriers remained an obstacle to optimal oil spill response).

Adapt: The final component of the RRP framework is Adapt. This is illustrated as the feedback loops on the diagram (Figure 16). The Task Force should continue to assess the region (sensitivities in the region), the risk (probability and consequences), and preventative measures and preparedness (regulations, standards, infrastructure). This ensures the RRP adapts to regional changes and addresses any shortcomings. One example of adapting is annually updating the ERI map, comparing the RO caches to areas of highest risk, and moving caches when applicable.

CHAPTER 7: DISCUSSION

This section discusses: the advantages and disadvantages of focusing on a regional, risk-based response plan; limitations; and future studies. The RRP aims to clearly define roles and responsibilities (both regulatory, operational, scientific), base decision-making on scientific evidence (statistical risk, modelling of oil spill trajectory), and identify long-term solutions to marine oil spill management (feedback loops, adaptive management).

7.1. Advantages

The underlying argument of this paper is that the current national framework is not fit for its purpose, and a regional risk-based framework should be implemented instead. While the current framework has a very low incident rate, and Canada has had no major spills since its implementation, there are significant regional differences seen across the Nation that are not being considered. An RRP is able to account for regional variations, and make Canada's prevention and response regime stronger. Multiple studies indicate that risk for marine oil spills vary by region, and the SOPF annual report indicates there are differences in claims submitted by region.

Although the NOSPRR is effective and has regional components, adaptation to a regional strategy could further improve an already good system. An RRP will:

- account for regional environmental (biological and physical), economic, and social sensitivities;
- improve communication pathways between government departments and between the task force and local communities;
- tailor response strategies to regional conditions;
- adapt to changes in regional traffic (i.e. if new ports are developed, and levels of traffic change).

Finally, much of the foundational work required for development of an RRP management strategy has already been completed (through the ARA reports, and the ARP and RRP pilot projects).

7.2. Disadvantages

While the proposed framework and shift to a regional response would improve the existing system, it is important to consider potential disadvantages. Benefits of the current system include:

- proven efficiency and efficacy since implementation;
- regional considerations through GRSs, REETs, and RACs;
- and, established regulations, roles, standards, and procedures.

Potential disadvantages of shifting to RRP include:

- RRP could be considered redundant, as the national framework has regional components;
- RRP is only applicable to two of the response organizations (ECRC and WCMRC), as the other two have smaller areas of response;
- There would be costs associated with changing the framework;
- And, the transition period between the current framework and RRP could lead to confusion and unclear directives and responsibilities.

As the need for an RRP was identified in 2013 by TSEP, and there has been little movement towards RRP implementation, there may be a lack of government motivation to alter the national oil spill response plan. This could be due to a number of factors, including recurrent shifts in political focus (frequent elections), lack of implementation strategies, or the costs associated with RRP development.

7.3. Limitations

Throughout this project, a number of limitations were identified, which are divided into two categories: limitations to the ARP/RRP pilot projects, and limitations to this project.

Within the ARP and RRP projects, there were limitations such as:

- limited availability of data (i.e. using only one year of shipping data);
- limited variables of risk modelling (i.e. climate change and weather were not included in the area risk assessment model);

When completing this project, a few limitations were identified:

- Many of the TSEP recommendations were clearly addressed, or absent, in the ARP pilot project. However, it was harder to find information about the status of the ARP recommendations. The RRP project conducted in BC would likely have addressed some of these recommendations, however this project did not find evidence to suggest what improvements, if any, were achieved (i.e. if there was improvement on standardization, or some of the identified communication issues).
- This project is not a government-backed project. Since the TSEP recommendation for RRP in 2013, there have been limited advancements. It is understandable that it will take time to shift from a national “one-size-fits-all” plan to a national framework consisting of regional plans, and this study is idealistic in terms of what can be achieved in the coming years.
- This project was independently developed by a Masters-level Marine Management student, rather than in collaboration with a team of experts and stakeholders. Gaps in the author’s experiences and connections may have implications for the generalizability of findings.

7.4. Future Studies

While this project aims to consider a range of conditions, the scope was restricted geographically, and by some of the limitations listed in section 7.3. A number of related topics

that could be expanded to a future study have been identified and listed below. These topics should be researched to allow for a more complete understanding of the risks and benefits involved in the creation of an RRP framework.

- **Inclusion of Arctic regions:** The NOSPRP only includes waters south of 60°N, thus excluding Canada's Arctic waters (TC, 2016a). Shipping in this region has tripled from 1990 to 2015 through use of the Arctic Bridge Route, and the Northwest Passage. Despite this increasing traffic, there is currently no Response Organization in the Arctic. Northern communities rely on oil for power, so sealifts involve tankers, in addition to general cargo. The change from a national plan to a regional, risk-based plan would allow for these areas, and their unique challenges to be included and protected. As such, area risk assessments for the Arctic coastline should be prioritized (TC, 2020b).
- **Inclusion of freshwater regions:** The ARA does not apply to freshwater environments, such as the Great Lakes (DCL, 2017). ECRC operates in the Great Lakes region, where both national and international shipping occurs. Area risk assessments should be performed for the Great Lakes, as the freshwater region has unique risk factors and consequences of ship-sourced spills.
- **Further research into incidents:** Further research into incident trends (location, season, vessel type, near misses, and other incidences or occurrences) would allow the government to better understand the causes behind these incidents. Through an understanding of causes and risk factors of historical oil spill incidents, governing bodies and stakeholders can move forward to better protect our waters from known hazards.
- **Changes in liability and compensation:** This project did not address any recommendations regarding changes to the structure of the liability and compensation aspect of the oil spill response regime. Future research could assess how changes to the national plan impact compensation and liability.
- **Costs:** There will be costs associated with developing and implementing a new framework for RRP. One recommendation from the TSEP suggested that TC collaborate with the ROs and industry partners to determine what costs will be involved, and how to fund this project (TSEP, 2013).

- **Climate change:** WSP did not include weather (or climate change) which could impact risks. Future studies should include climate change modelling as a means of predicting how shipping will change (i.e. location and seasonal use of shipping lanes, avian and marine species habitat ranges, and physical ocean conditions). For example, melting sea-ice due to climate change will extend the shipping season in northern waters, and also allow for more northern shipping, which has implications for potential oil spills (TC, 2020b).
- **International Research:** As it stands, Canada is a global leader in oil spill prevention and response, but other nations such as the United States or Nordic countries may utilize practices and/or technologies that could be adapted to use in Canadian waters. Researching other nations' use of national and regional standards and management regimes is suggested; this would offer insight into a broader range of innovative ideas and best practices that could be applied in Canada.

CHAPTER 8: MANAGEMENT RECOMMENDATIONS

8.1. Key Recommendations

The following recommendations emerged during this project. They have been developed based on an analysis of the current management framework, including reports from the TSEP and the ARP project.

- Risk-based regional response planning needs to be integrated into the national plan, creating a standardized framework for regional response with clear directives and guidelines. This will ensure consistency across regional plans. The data reviewed by this project indicates that the probability of a spill varies greatly between regions (WSP, 2014). This supports the case for a regional, risk-based management plan. In the Executive Summary, WSP stated “These results demonstrate the need for Canada to tailor its preparedness efforts for each sector of the country, as the risks across the country are demonstrably different” (WSP, 2014, p. iii). The result of the DLC project was a risk assessment methodology (Figure 11). This methodology can be applied across Canada, informs the government and stakeholders, and ensures decisions are backed by scientific evidence.
- The development of the RRP needs to take into consideration several years of data, so that regional trends may be clearly understood (for instance: annual or seasonal changes in types of vessels). This is imperative to accurately calculating risk during Phase 2.
- If an RRP is not implemented, Transport Canada should consider recommendations relating to the Response Organizations, including setting regional standards and a requirement for Geographic Response Strategies.
- An action plan is suggested to ensure recommendations (made through incident reports, and the reviews of NPP, ARP and RRP) are implemented within a reasonable timeframe. Issues identified in these reports and reviews should be addressed in a timely manner to ensure that Canada’s oil spill prevention and response regime is a preventative process, not a reactive process. These reports, and follow-up reports on the status of these recommendations, should be made public. Sharing research ensure stakeholders are kept

informed of current risks, and holds agencies accountable to implement preventative measures.

- Both the TSEP and ARP identified the need for improved coordination and communication between government departments. Roles, responsibilities and scope of authority need to be clearly defined. If these gaps are not addressed, there will continue to be siloed decision-making, which can lead to misinformed or redundant actions.
- Through the development of an RRP, regions should receive pre-approval for specific clean-up methods (dispersants, in situ-burning, etc.), as appropriate based on regional environmental, economic and social conditions.
- A standardized RRP process should be implemented nation-wide (including Arctic and freshwater environments). Individual ARAs will account for the regional differences, while still allowing these environments to follow national standards for regional response planning.

8.2. Conclusion

In the 2013 TSEP report, the Government of Canada was given the opportunity to improve their marine safety regime through tangible recommendations. While the existing plan was considered to be effective, continued growth in the shipping sector has experts predicting a catastrophic spill within the next 15 years. Canada should implement the TSEP recommendations into the national oil spill response regime before the next major spill occurs. The results from this paper's analysis can be summarized in four key points:

- Canada exhibits regional variances in shipping (ship traffic and incidents), human, and environmental sensitivities. These variances are currently taken into consideration in the Response Organizations (ROs) as Geographic Response Strategies (GRS), but are not presently integrated into the national framework. The Area Response Planning (ARP) pilot project demonstrates that a regional, risk-based approach is both plausible and effective when done correctly.
- This study uses the key findings and recommendations from the ARP pilot project and the Tanker Safety Expert Panel (TSEP) report to establish a framework to implement regional response plans. Key points in the Regional Response Plan framework relate to

stakeholder engagement, communication and data sharing between federal departments, clear roles and responsibilities, and the use of scientific and expert advice.

- Methodology and the RRP process needs to be standardized across the nation. WSP (2014) stated that “to ensure that planning for each area of the country takes place in a similar manner, a standardized planning process is required to guide the development of the Area Response Plans for each Area of Response”. An RRP framework that can be applied to regions across Canada would ensure all spills are responded to in the same manner.
- The framework developed in this paper includes feedback loops from the review phase to all other phases. This ensures that this management framework is adaptable and sensitive to change. Year to year, a region may experience changes in shipping (i.e. development of a new port), local industries (i.e. development of an aquaculture farm), or changes in species (i.e. a species-at-risk may move into the area due to climate change). In some capacity, each of these factors influences the risk and/or the consequences of an oil spill. Canada needs to reassess these factors regularly to manage oil spill prevention, preparedness and response.

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APPENDIX A: TSEP RECOMMENDATIONS

Table 4: Recommendations from the TSEP in 2013.

| # | Recommendation |
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| 1 | “Transport Canada should require Response Organizations to have in place the arrangements for cascading resources and mutual assistance agreements necessary to address a worst-case discharge in their Areas of Response.” (TSEP, 2013, p. 15). |
| 2 | “The Government of Canada should implement a risk-based Area Response Planning model to prepare for ship-source oil spills.” (TSEP, 2013, p. 16). |
| 3 | “Transport Canada should regularly review and update the national Risk Assessment for Marine Spills in Canadian Waters and make these results public.” (TSEP, 2013, p. 17). |
| 4 | “Transport Canada should designate new Areas of Response, based on the national Risk Assessment for Marine Spills in Canadian Waters.” (TSEP, 2013, p. 17). |
| 5 | “Using a consistent methodology, Transport Canada should perform regional risk assessments for each Area of Response and make the results public.” (TSEP, 2013, p. 18). |
| 6 | “Transport Canada, in collaboration with the Canadian Coast Guard, Environment Canada and Response Organizations, should develop a standardized process for risk-based Area Response Planning.” (TSEP, 2013, p. 19) |
| 7 | “The Canadian Coast Guard should lead the Area Response Planning process for each Area of Response with Transport Canada, Environment Canada and the Response Organizations operating within in.” (TSEP, 2013, p. 20) |
| 8 | “The Canadian Coast Guard should invite other stakeholders who are involved in oil spill preparedness and response to participate during the planning process. The Area Response Plans should be made publicly available.” (TSEP, 2013, p. 20) |
| 9 | “The Canadian Coast Guard should ensure the Area Response Plans identify the resident capacity (e.g., equipment, personnel, management systems) required to address all Probable Spill Scenarios in the Area of Response. The plans should also include all of the Response Organizations’ arrangements for cascading resources and mutual assistance agreements required to address a worst-case discharge.” (TSEP, 2013, p. 21) |
| 10 | “Transport Canada should require Response Organizations to develop detailed Geographic Response Plans to minimize potential spill impacts to key environmental and socio- economic sensitivities. These Geographic Response Plans should include specific time standards and identify the response resources that would be maintained locally.” (TSEP, 2013, p. 22). |
| 11 | “Transport Canada should certify Response Organizations based on their Area Response Plans and Geographic Response Plans, which may include the use of alternative response techniques.” (TSEP, 2013, p. 23). |

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| 12 | “Transport Canada should be granted additional enforcement and oversight tools to ensure that Response Organizations meet the requirements outlined in their Area Response Plans.” (TSEP, 2013, p. 23). |
| 13 | “The Government of Canada, in consultation with the provinces and territories, should develop a strategy for the timely disposal of oily waste, and incorporate the results of this strategy into the Area Response Planning model.” (TSEP, 2013, p. 24). |
| 14 | “Environment Canada and Fisheries and Oceans Canada should develop and implement a strategy to provide aid to wildlife and incorporate the results of this strategy into the Area Response Planning model.” (TSEP, 2013, p. 24). |
| 15 | “The Area Response Planning model should include requirements for a multi-jurisdictional exercise program for each Area of Response. Regular exercises should be conducted in each Area of Response to test specific components of the Area Response Plans.” (TSEP, 2013, p. 25). |
| 16 | “Transport Canada should collaborate with Response Organizations and other industry partners to determine the new costs associated with implementing the Area Response Planning model. All parties should then work together to develop a fee structure that will fund this new model.” (TSEP, 2013, p. 25). |
| 17 | “The Government should ensure that Transport Canada has the appropriate resources and competencies to deliver risk assessments and risk advice in support of oil spill planning and preparedness.” (TSEP, 2013, p. 25). |
| 18 | “The Government should proceed with its recently announced plans to increase the effectiveness of the legislative and regulatory framework governing oil handling facilities, including a more stringent inspection and enforcement program.” (TSEP, 2013, p. 25). |
| 19 | “The Government should properly resource the Canadian Coast Guard to lead planning in the Area Response Planning process.” (TSEP, 2013, p. 25). |
| 20 | “The Government should remove the legislative impediments for the use of alternative response techniques.” (TSEP, 2013, p. 25). |
| 21 | “The Canadian Coast Guard should be the final authority to approve the use of spill treating agents and other alternative response techniques and should be supported by a standardized process taking into account the net environmental benefit concept, as an element of the Area Response Planning process.” (TSEP, 2013, p. 27). |
| 22 | “The Government should proceed with its proposed amendments to S. 181 (2) of the Canada Shipping Act, 2001, through the Safeguarding Canada’s Seas and Skies Act, which would extend liability protection to responders and their agents and mandataries, in the context of ship-source spills and spills at oil handling facilities when loading or unloading a ship.” (TSEP, 2013, p. 28). |
| 23 | “The current limit of liability per incident within the Ship-source Oil Pollution Fund should be abolished. The Fund should process and pay for all admissible claims, subject to the Consolidated Revenue Fund’s consent to loans in favour of the Ship-source Oil Pollution Fund for amounts sufficient to allow all admissible claims to be paid to |

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| | claimants. The loans would be reimbursed with interest to the Consolidated Revenue Fund from future revenues of levies on oil transported by ship to, from and within Canada.” (TSEP, 2013, p. 31). |
| 24 | “The funding activities of the Ship-source Oil Pollution Fund should be broadened to allow the Fund to establish an emergency account to support oil spill operations undertaken by the Canadian Coast Guard when it assumes the role of On-scene Commander.” (TSEP, 2013, p. 31). |
| 25 | <p>“The Government should create a senior-level Interdepartmental Committee to provide enhanced stewardship of the Regime. The Committee should be composed of the lead departments (i.e., Transport Canada, the Canadian Coast Guard and Environment Canada). Its Terms of Reference should include:</p> <ul style="list-style-type: none"> • Ensuring individual departmental mandates are properly coordinated; • Ensuring that joint planning and prioritization efforts are occurring, including the development and maintenance of a comprehensive national contingency plan; • Ensuring efficient allocation of resources within each department, including training, oversight and enforcement of regulation, capital investments, and research and development; • Ensuring regular coordinated interdepartmental exercises; • Ensuring succession planning and bringing attention to the need for appropriate distribution of skill sets related to oil spill preparedness and response within relevant organizations; and • Providing routine reporting and advice to their three Ministers on the functioning and continuous improvement of the Regime, including cyclical reviews of the Regime.” (TSEP, 2013, p. 33). |
| 26 | “The Incident Command System model should be incorporated into a joint National Contingency Plan, which clearly defines the roles and responsibilities of all federal participants in the response to a ship-source spill.” (TSEP, 2013, p. 34). |
| 27 | “Transport Canada, in its certification of Response Organizations, should ensure that Response Organizations use, train their personnel in, and exercise with an incident management system that is compatible with an Incident Command System.” (TSEP, 2013, p. 34). |
| 28 | “Building on the regional exercise programs, the Canadian Coast Guard should develop annual exercise objectives to systematically test various components of the National Contingency Plan and all management functions under the Incident Command System model. These objectives should expand outside current Canadian-U.S. exercises, with special focus on the Canadian Coast Guard’s role as On-scene Commander.” (TSEP, 2013, p. 34). |
| 29 | “The Government should ensure that Transport Canada and Environment Canada have the appropriate resources to adopt and integrate the Incident Command System at the regional and headquarters levels of their organizations.” (TSEP, 2013, p. 34). |

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| 30 | “The Government of Canada should clarify its policy on the authority of the Canadian Coast Guard to intervene or support the response to land-originating oil spills that result in marine pollution.” (TSEP, 2013, p. 35). |
| 31 | “Environment Canada should strengthen its commitment to providing leadership in scientific and environmental advice related to spill preparedness activities, through active and sustained participation in Area Response Planning at the regional level, and with Fisheries and Oceans Canada as a source of scientific advice.” (TSEP, 2013, p. 37). |
| 32 | “The Canadian Coast Guard, in its role as either On-scene Commander or Federal Monitoring Officer, should have the authority to request and obtain a scientific and environmental advisor from Environment Canada, to be on-site during a response to provide local environmental and ecological advice, with scientific support from Fisheries and Oceans Canada.” (TSEP, 2013, p. 37). |
| 33 | “Environment Canada’s role in the Regime should be formalized by including, in Part 8 of the Canada Shipping Act, 2001, its responsibility to provide scientific and environmental advice in the planning for and response to ship-source oil spills.” (TSEP, 2013, p. 38). |
| 34 | “With a view to fostering public confidence in the Regime, Transport Canada and the Canadian Coast Guard should conduct regular outreach to the public to communicate the level of risk that Canada faces. Transport Canada should also explain how the various components of the system function, including prevention, preparedness, response, and liability and compensation.” (TSEP, 2013, p. 40). |
| 35 | “The Government should make information on spills and their causes available to the public in a timely manner.” (TSEP, 2013, p. 40). |
| 36 | “We recommend that the Government develop and publish a National Framework for Ship-source Oil Spills.” (TSEP, 2013, p. 40). |
| 37 | “The Government should disband the Regional Advisory Councils.” (TSEP, 2013, p. 41) |
| 38 | “On a routine basis, the senior-level Interdepartmental Committee should appoint experts to conduct in-depth reviews of specific aspects of the Regime and report back to their respective Ministers.” (TSEP, 2013, p. 43) |
| 39 | “The Canadian Coast Guard should work in close collaboration with Transport Canada to improve the information collected on ship-source spills and vessel movements in Canadian waters, and to put in place appropriate quality assurance measures to ensure the accuracy of the recorded data.” (TSEP, 2013, p. 44) |
| 40 | “The Canadian Coast Guard, jointly with Transport Canada, should analyze spill data on a regular basis to identify lessons learned and to improve the Regime.” (TSEP, 2013, p. 44) |
| 41 | “Environment Canada, in collaboration with Fisheries and Oceans Canada, should collect and collate environmental sensitivity information for each Area of Response and make this information publicly available.” (TSEP, 2013, p. 44) |

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| 42 | “The Canadian Coast Guard should create and sustain a spill response resource inventory to include resources held by Response Organizations, oil handling facilities and offshore oil and gas platforms across Canada. The new system should include up-to-date response equipment data and be kept current to account for equipment movement or relocation.” (TSEP, 2013, p. 45) |
| 43 | “The Government should ensure that post- incident environmental monitoring is conducted to evaluate any potential long-term impacts of oil spills, and to ensure that oil spill preparedness and response continues to learn from past experiences to reduce the environmental and socio-economic consequences of spills.” (TSEP, 2013, p. 45) |
| 44 | “The Government should conduct a risk assessment of wrecks in Canadian waters to identify potential pollution sources and to inform future policy decisions.” (TSEP, 2013, p. 46) |
| 45 | “The Government of Canada should collaborate with industry to establish and together fund a Canadian research and development program for oil spill preparedness and response. Research priorities should be identified through collaboration between industry, government and academia.” (TSEP, 2013, p. 46) |

APPENDIX B: STATUS OF ARP RECOMMENDATIONS

Table 5: Recommendations from the ARP and current status of these recommendations. Colour coded to reflect if (Y) Yes, the recommendation has been met, or is in the process of being met; (N) No, the recommendation has not been met; (P) The recommendation has partially been met; or (U) Current status is unknown, or data is unavailable. Identification of recommendations are by category (1 – Risk Assessment, 2 – Sensitivity data collection, standardization and integration, 3 – Building Area Response Plans, 4 – Regime and policy Implications, 5 – Engagement, and 6 – Governance and collaboration across agencies) and then by recommendation number (i.e. 1.1. is the first recommendation in the Risk Assessment category).

| # | Recommendation | Met | Implementation Status |
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| 1.1 | “To be an effective input for planning, data should be collected prior to the development of an ARA. Planners should have access to up to date risk information, as well as data to support the identification of historical trends, prior to commencing planning activities or updating an existing plan.” (TC, 2013) | P | “Fisheries and Oceans Canada and Environment and Climate Change Canada also increased data integration and sharing within the federal family related to environmental sensitivities, which will be enhanced as RRP progresses” (TC, 2018b). |
| 1.2 | “In-house capacity should be established to provide flexibility for the continued development of ARA modelling in support of emergency response planning, including the ability to adjust modelling parameters to determine value and impact of applied mitigation and planning efforts.” (TC, 2013) | P | The OPP has supported projects that developed ocean, wave and ice forecasts, which can support spill response (TC, 2020d). |
| 1.3 | “Due to the number and variety of subject matter experts involved, a common lexicon should be established at the outset of the ARA process” (TC, 2013) | N | There is no evidence of a common lexicon being established |
| 1.4 | “There should be a comprehensive review of the ARA methodology by subject matter experts, including Indigenous partners and industry stakeholders, to ensure that it is aligned with RRP objectives, provides a clear definition of data requirements and generates outputs that can be applied to RRP. The methodology should be presented in a way that enables those without significant technical knowledge to meaningfully contribute to the analysis.” (TC, 2013) | U | |

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| 1.5 | “Additional risk inputs beyond the ARA should be identified, validated and applied to response planning if and where applicable. This could include risk assessments developed by provincial and municipal governments, Indigenous organizations or environmental non-governmental organizations.” (TC, 2013) | N | Reviewing documentation from CCG (2017) indicate this recommendation has not been taken into consideration. |
| 2.1 | “The project scope should be clearly defined at the outset of planning activities and sufficient time should be allocated to undertaking thorough data needs assessment in advance of the development of the ARA and/or RRP.” (TC, 2013) | U | |
| 2.2 | “Data sharing protocols and agreements, including protocols and agreements for data handling and storage, should be established at the outset of the project.” (TC, 2013) | U | |
| 2.3 | “Interoperable data platforms that facilitate data integration should be developed to improve data access and use in all aspects of planning. Supporting procedures for the collection and storage of data relevant to risk and response planning should be identified and established (i.e. AIS multi-year database, accident statistics, weather information, etc.) to make up to date information continuously available for planning.” (TC, 2013) | P | The OPP supported projects developing ocean, wave, and ice forecasts, statistical metrics to measure trajectory uncertainties, to support spill response (TC, 2020d). The Enhanced Maritime Situational Awareness system is designed to aid in decision making in coastal areas by “providing information and data on such topics as: vessel traffic, weather, hydrography and sensitive ecological areas” (TC, 2020d). |
| 2.4 | “Timelines developed for the planning process should ensure adequate time is available for the identification of data sources, data collection and synthesis both prior to the risk assessment and as part of the planning process.” (TC, 2013) | U | |
| 2.5 | “A methodology for the prioritization of environmental sensitivities should be developed by ECCC and DFO, in partnership with Indigenous and coastal communities and in consultation with other subject matter experts, to avoid deficiencies and inconsistencies in risk assessment and planning.” (TC, 2013) | U | |

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| 2.6 | “Grants and Contributions funding should be dedicated to building capacity within Indigenous and coastal communities, fisheries associations and environmental non-governmental organizations to continue to provide up to date and locally relevant socio-economic information and marine sensitivity data with the recognition that investments in capacity development may need to be maintained over time.” (TC, 2013) | U | |
| 2.7 | “Targeted efforts should be undertaken to address key data gaps identified as a result of the ARAs to support future RRP and emergency response activities.” (TC, 2013) | U | |
| 3.1 | “A clear planning process/methodology should be established at the outset of RRP that details each step of the planning process and what entities are involved. International best practices for risk-based response planning should inform the development of the planning process.” (TC, 2013) | P | Some aspects of this recommendation were mentioned while reviewing documents from TC (2018c) |
| 3.2 | “The scope, purpose, objective and content of RRP should be clearly defined prior to the commencement of the project in collaboration with Indigenous partners, provincial governments and scientific experts, and in consultation with industry and other stakeholders. This includes defining planning boundaries; identifying the types of spill response capacity that will be included as part of the plan; situating the plans within existing planning frameworks, both domestically and internationally; and, identifying the intended participants as well as the audience.” (TC, 2013) | P | Some aspects of this recommendation were mentioned while reviewing documents from TC (2018c) |
| 3.3 | “Response planning scope should look beyond the initial on-water response and include emergency management coordination to ensure public safety, preparedness structures for prolonged shoreline recovery operations as well as post-spill processes such | U | |

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| | as sampling plan templates and environmental and human health impact assessments.” (TC, 2013) | | |
| 3.4 | “Criteria for establishing RRP boundaries should include the results from previous area risk assessments as well as input from Indigenous partners, industry, scientific experts and other stakeholders.” (TC, 2013) | Y | |
| 3.5 | “Accountabilities, responsibilities and authorities in both preparedness and response should be clarified and established in an updated national framework.” (TC, 2013) | N | There has not been an updated national framework. |
| 3.6 | “Established tools should be used to validate and evaluate plans such as the Readiness Evaluation Tool for Oil Spills (RETOS), an internationally recognized evaluation tool used to assess oil spill response planning and readiness.” (TC, 2013) | U | |
| 3.7 | “Plans should be updated on a regular basis and a nationally consistent planning methodology should be reviewed against international best practices on a fixed schedule.” (TC, 2013) | N | There is no evidence of plans being updated regularly. |
| 4.1 | “Consistent and on-going policy support should be provided to planners throughout the Regional Response Planning process to analyse and address policy issues and questions related to the marine oil spill response regime.” (TC, 2013) | U | |
| 4.2 | “Strong linkages, coordination and coherence should be established between RRP and existing legislative and policy initiatives underway through the Oceans Protection Plan and existing programs (i.e. oiled marine mammals, alternative response measures, hazardous and noxious substances, seamless regime, marine spatial planning).” (TC, 2013) | U | |
| 5.1 | “Robust communications and engagement plans should be developed at the outset of the planning process and implemented consistently throughout. These should clearly articulate | U | |

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| | partnership parameters and support communication with existing and potential partners. In addition, adequate time should be allocated to developing meaningful and sustained partnerships.” (TC, 2013) | | |
| 5.2 | “Where possible, technology should be leveraged to facilitate engagement and collaboration including using online fora and web-based tools for seeking input and sharing documents. However, this should be balanced with ensuring that communities with limited access to the internet also have access to relevant materials and opportunities to provide feedback.” (TC, 2013) | U | |
| 5.3 | “Internal and regionally-based expertise should be used for the development and implementation of an engagement plan and communications products. This includes using meeting facilitators where possible to assist with enhancing the effectiveness of meetings and reducing any perceived bias during engagement forums.” (TC, 2013) | U | |
| 5.4 | “Information sharing should strive to find a balance between transparency and protection of sensitive or proprietary information. This includes identifying appropriate formats and fora for information sharing and developing reports, for both ARA and RRP, that are accessible to the general public, rather than just subject matter experts.” (TC, 2013) | U | |
| 6.1 | “A governance structure should be established that creates strong intra- and inter-agency connections between the regions and headquarters. In addition, the governance structure should identify how partners and stakeholders both internal and external to the federal government will be involved in response planning.” (TC, 2013) | U | |
| 6.2 | “Decision making within the established governance structure should be supported by subject matter expertise. This includes | U | |

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| | developing a means to facilitate collaborative and integrated information sharing on topics such as data management, policy and engagement to support informed decision-making.” (TC, 2013) | | |
| 6.3 | “Working groups/task forces should be established that include all parties implicated in a spill response. This may require the engagement of umbrella organizations or aggregate structures to communicate with a broad range of partners. Where possible, existing governance frameworks should be leveraged for engagement activities.” (TC, 2013) | U | |
| 6.4 | “An integrated project charter and implementation plan should provide a clear direction related to accountabilities, roles and responsibilities, tasks and timelines. As part of this plan, the initiation of the project should be clearly identified to generate project momentum and facilitate engagement with project partners.” (TC, 2013) | U | |
| 6.5 | “An ongoing program for risk-based response planning should be implemented with expert-based support provided by implicated departments and sectors.” (TC, 2013) | U | |

APPENDIX C: STATUS OF BC RRP RECOMMENDATIONS

Table 6: Recommendations from the BC RRP and current status of these recommendations. Colour coded to reflect if (Y) Yes, the recommendation has been met, or is in the process of being met; (N) No, the recommendation has not been met; (P) The recommendation has partially been met; or (U) Current status is unknown, or data is unavailable. While these recommendations are specific to BC, the overall themes can be applied broadly across Canada. A report by Nuka (2016) was used to identify recommendations following this project.

| # | Recommendation | Met | Implementation Status |
|---|--|-----|-----------------------|
| 1 | “Align area response planning boundaries within BC by designating geographic sub-regions within the province, and create a multi-jurisdictional governing body (inclusive of local and First Nations governments) to oversee area response planning within each geographic region.” (Nuka, 2016) | Y | |
| 2 | “Establish Regional Community Advisory Councils within each geographic region, based on the Alaska/Sullum Voe model, and provide them with a governance role in area response planning.” (Nuka, 2016) | U | |

