

The Maritime Transport of Canadian Crude Oil

Improving Sustainability in the Age of Occupy Wall Street Protests.

1. Introduction

The marine transportation of crude energy products to international markets is of strategic importance to Canada. Recent research suggests that with better market access and new pipeline development could yield an additional \$131 billion to Canada's GDP by 2030.¹ Yet, across North America the transportation of crude oil has generated broad public opposition. The Keystone Pipeline proposal has caused a fierce debate in the United States. In Canada there have been numerous legislative attempts to ban oil tanker traffic off the northern portion of Canada's west coast. The Occupy Wall Street movement has focussed the public and political attention on sustainability because a rising tide of popular opinion is fuelled by the belief that limiting the expansion of energy transportation infrastructure is an effective way to not only prevent environmental damage, and contribute to increased sustainability.²

This paper will provide an analysis of the maritime transport of moving crude oil and explore the economic, social and environmental perspectives that are influencing the public debate. The paper will examine the existing regulatory regime and shed insight into the risks and outcomes of the present regulatory framework. The authors will "stress test" the existing framework to determine if it is adequate to address the marine transport of bulk oil. The paper will conclude with some thoughts on enhancing and adapting sustainability outcomes related to shipping and port policy.

2. Economic Perspectives

Crude oil exports from Western Canada is growing and Canada is a large and growing net exporter of crude oil. Many have called Canada an emerging energy superpower. Alberta alone has 176.1 billion barrels of oil, or about 14 percent of world reserves. Increased oil sands production not only brings with it the possibility of existing pipeline capacity constraints but also a continuation of depressed prices. A study done for Alberta Energy indicates that oil producers could loose \$72 billion over

nine years if a pipeline to the West Coast is not built because of a price differential.³

The bulk transportation of crude oil in Canada has predominately relied on the pipeline and maritime modes. As the single largest commodity handled within the Canadian marine transportation system, crude petroleum represents almost 20% of the total tonnage carried by sea. Due to logistics and transportation costs, eastern Canada is dependent on foreign crude oil for a significant portion of its refinery production.

In Western Canada, various feeder pipelines gather and move oil sands production from northern Alberta and converge at two main hubs in the Edmonton region. The Edmonton hub has two main transmission pipelines. Enbridge Pipelines Inc. is the major carrier of crude oil to eastern Canadian and U.S. markets, while Kinder Morgan's Trans Mountain Pipeline System moves crude oil to the Pacific coast. Over the last decade about three-quarters of Canada's oil sands production was delivered to domestic refineries. Traditionally, the largest export markets for Alberta crude oil are the Midwest and Rocky Mountain regions of the United States. For a number of years the Alberta Energy and Utilities Board and the Canadian Association of Petroleum Producers have been reporting that the expected increase in oil sands production will result in pipeline availability constraints.

Since 1953 the 1,150 km Kinder Morgan Canada Trans Mountain pipeline has transported crude oil and refined products from Edmonton to marketing terminals and refineries in Greater Vancouver and Puget Sound in Washington State. Between 50,000 to 80,00 barrels a day (or about 25%) of the shipments now go through the Westridge marine terminal in Vancouver Harbour. Currently the Westridge marine terminal is the only facility on Canada's west coast that can ship crude oil by ocean-going vessel. Port Metro Vancouver 2010 cargo data indicates that crude petroleum cargo exports totalled 4,247,887 metric tonnes; an increase of 92% from the depths of the recession in 2008.⁴

The Kinder Morgan Trans Mountain Pipeline Expansion (TMX) represents a cargo and market extension for Port Metro Vancouver. Kinder Morgan's three-phased approach to their TMX project first involved constructing a 178 km-section of 32-

inch pipe looping the east end of the Trans Mountain system. The second phase brought increases in pipeline capacity by adding new pumping stations through to the port of Vancouver. The firm is planning further expansion so that Westridge could handle 450,000 bpd and the construction of a second berth to accommodate Suexmax tankers.

The proposed Enbridge Gateway project would transport crude oil and refined products from Edmonton to a marketing terminal at the Port of Kitimat. The Gateway proposal represents both a cargo and market diversification opportunity for the port.⁵ Enbridge's CEO and transportation economists suggest that China, Japan, South Korea, and California would be the target markets. The project would require construction of a new 30-inch crude oil pipeline, bulk liquid crude storage facility and marine terminal. The company estimates that annual tanker traffic will be comprised of 50 VLCC, 120 Suezmax tankers and 50 Aframax vessels.

From an economic perspective, the transportation sustainability of Canadian crude oil exports by pipeline and tankers to Asian markets raises many important issues. Research by Moore, Flam, Hackett et. al. (2011) indicates that the benefits from increased market access through transportation improvements are unequally divided. Ninety-five percent of the additional economic impact of a west coast pipeline (measured by increases in GDP) would be attributed to Alberta and about 1% to British Columbia. Additional tax receipts as a result of increased oil sands production and shipped to Asia would be experienced in Alberta with 92% of the indirect taxes, personal income tax, and corporate taxes occurring in that province and 1.6% in BC.⁶ These estimates gives some credence to coastal and First Nations communities concerns about economic justice and equity impacts associated with the various pipeline expansion projects.

2. Social Perspectives

The sustainability of crude oil transportation by pipeline and tankers raise social dimensions that are perhaps the most politically perplexing public policy area for identifying a sustainable level of activity. A main street social response to the development and transportation of crude oil products is driven by the memories and images of the 2010 Deep Horizon oil spill in and the 1989 Exxon Valdez oil spill. These types of events serve

to fuel an anti oil tanker public sentiment and calls for political actions to ban this economic activity. The Occupy Wall Street protest phenomena captures a very significant portion of the public sentiment when they draw attention to issues such as global citizenship, economic justice, corporate power, and how profits are shared privately by shareholders but environmental losses are socialized; topics that perhaps go far beyond the traditional approaches used in regulatory processes to determine what is in the national or public interest. Such public sentiments also leads to criticism of purely technical reviews of safety issues governed by a statute such as the *Canada Shipping Act, 2001*.

It can be argued that the Occupy Wall Street movement port protests that occurred in Los Angeles/Long Beach and Port Metro Vancouver⁷ were of little immediate consequence. Nevertheless they show that the transportation sector is considered a legitimate target for social/political actions. Successful protests could impact the Pacific Gateway's reputation for reliability, or call into questions a port's social license to operate and create barriers in a confined harbour.

While most of the recent attention has focused on oil tanker traffic from new pipeline developments, it is important to note that crude oil and product tanker traffic in either Canada's Exclusive Economic Zone (EEZ), internal waters, and the Strait of Juan de Fuca since the completion of the Alaskan pipeline at Valdez, Alaska in 1975 and prior. Beginning in 1982, BC's north coast experienced significant methanex exports in chemical tankers until the production facility at the Port of Kitimat closed in 2005. Since then approximately 22 tankers have imported condensate into Kitimat for shipment by rail to Alberta each year. In addition, the oil export port of Valdez Alaska averaged 401 vessels calls per year between 2002 and 2010 that generated marine traffic in Canadian waters. On BC's southeast coast the Westridge marine terminal in Port Metro Vancouver generates an average of 90 tanker vessel visits each year. However, the tanker traffic generated by the top 10 Puget Sound locations generate an average of 1,028 tanker port calls and about 3,200 tug and tank barge movements each year.⁸

Residents of coastal communities believe they are exposed to most of the risks with increased tanker traffic and doubt that sufficient resources from the economic wealth generated by an

expanding oil sands industry will be directed towards protecting their interests and the marine environment. Citizens are all too well aware of past efforts to reduce the size of the federal deficit through the reduction in coast guard services (such as the highly symbolic de-staffing of lighthouses) and ad hoc actions such as the recent reduction of officers on duty at Canadian Coast Guard Marine Communications and Traffic Centers. Alan Hughes the regional director of CAW local 2182 noted that it is unilateral decision being made in Ottawa by the coast guard bureaucrats that causes public frustration. Mr. Hughes observed that civil servants “may be willing to assume the risk of reducing the number of people on watch to save money on overtime costs” but he doesn’t think its fair for them to place those risks on the lives of people in the coastal communities.⁹

Parliamentarians in response to public sentiments have engaged in a number of recent attempts to address concerns by introducing private member sponsored legislation to ban oil tanker traffic in west coast waters. In 2009 Bill C-458 sought to amend the *Canada Shipping Act, 2001* to prohibit oil tankers in Dixon Entrance, Hecate Strait and Queen Charlotte Sound and in 2010 Bill C-606 was introduced into the House of Commons. The later bill was an Act to amend the *Canada Shipping Act, 2001* to prohibit the transport of oil by tankers on Canada’s Pacific North Coast. In 2011 the contents of Bill C-485 were reintroduced as Bill C-21.

The BC provincial NDP, with almost half of their entire caucus representing coastal ridings, have come out in favour of these legislative attempts without urging that a robust regulatory impact analysis or risk assessment be completed. With proposed federal legislation in Canada, there is normally a regulatory impact analysis that examines the proposed legislation and its costs and benefits. In addition, there is also consultation with stakeholders to look at the issue in its entirety so proposed legislation can be improved. Superimposed on this process are the international obligations that also need to be considered properly. Unfortunately, the three most recent private member’s bills fell short of this standard practice.

When reviewing the social dimensions of crude oil pipeline development and increased tanker traffic in British Columbia, it is important to acknowledge that there are important First

Nations aboriginal rights and title enshrined in the Canadian Rights and Freedoms that must be considered. For example, the Haisla First Nation, whose traditional territories include the port of Kitimat, have been very public with their intentions to contest the boundaries of the national interest test embedded in the federal National Energy Board regulatory process. The argument being advanced by the Haisla is that aboriginal “rights and titles are protected by the Constitution. And nowhere do (they) see that being overridden by national interest or economic development.”¹⁰ The ambit of First Nation issues on shipping and navigation in coastal waters is something that has not been judicially considered.

3. Environmental Perspectives

There is no issue that ship-source problem is a problem. The Pacific Regional Advisory Committee on Oil Spill Response created under the *Canada Shipping Act, 2001* has noted a lack of global experience with oil spill response and prevention when transporting unconventional oils (synthetic crude and diluted bitumen). It is a significant environmental concern because the usual recovery systems and booming techniques have proven ineffective¹¹ with the types of products to be ship from Alberta oil sands. To assess the adequacy of the policy instruments available to address concerns it is useful to explore two streams of environmental thought because the application of the respective environmental approaches have relevance to the development of maritime law.

The first environmental perspective could best be described as the use of a “multi-party framework” to protect the public interest. While not without some controversy, it is exemplified by the Pacific North Coast Integrated Management Area (PNCIMA) initiative. While Canada is not a leader in either coastal zone management, or marine spatial planning this initiative with federal participation sought to ensure a healthy, safe, and prosperous ocean area by engaging all interested parties in the collaborative development and implementation of an integrated ocean management plan to include all marine stakeholders.

The second environmental perspective could best be described as “direct action” at the local level as being the best way to protect the public interest. The Dogwood Initiative’s ‘No Tankers: Our Coast Our Decision’ campaign clearly represents an

environmental perspective where coastal citizens are to have the final say in determining the public/national interest.

The use of a “multi-party framework” to achieve environmental benefits is an intrinsic part of maritime law. There are many multi-party international conventions governing shipping. For example, the *International Convention on the Prevention of Pollution from Ships* (MARPOL), MARPOL provides an environmental code for shipping and the various annexes set out the requirements for pollution prevention. There is a provision to create special areas that restrict navigation to protect the marine environment beyond the territorial sea. Canada created a special area at the mouth of the Bay of Fundy to protect right whales from tankers transiting to the large oil refinery at Saint John, New Brunswick.

In a direct response to pollution incidents, a multi-part process has also been used to develop a number of pollution response conventions and liability regimes. These have been adopted internationally and a strict liability and compensation regime has been set up to provide financial compensation arising from ship-source oil pollution. Various coastal states’ have adopted into their domestic law these international conventions and provides compensation for claimants up to a pre-prescribed limit. For example, the *Ship-Source Oil Pollution Fund* administers claims in Canada and makes contributions to the international fund. The monies are a subset of the consolidated general revenue fund of the Government of Canada and are in excess of \$392 million, which was obtained by a levy on tanker traffic cargoes since the early 1970s.

Multi-party cooperation also arises from agreements between coastal states. On the west coast, the US Pacific States/British Columbia oil spill task force was set up between the states of Washington, Alaska and the province of British Columbia to look at how to minimize oil pollution risks along their coastlines.

4. Crude Oil Transportation Risks and Outcomes

The risks associated with the maritime transport of crude oil in Canada is primarily a function of both the absolute number of ship movements and the volume of cargo being transported. Before examining Canadian data, it is useful to consider the worldwide safety performance of the industry. Data from

Intertanko reveals that 99.9% of oil transported by ship arrived safely and that the total volume of cargo involved in oil spills declined significantly while the total tonnes miles of cargo increased. This data strongly suggests that the international regulatory structure has had positive effect on improving the safety performance of the world tanker industry. From an international perspective the risks associated with an oil spill in the marine environment have decreased over the years, primarily due to increased preventive measures including the phase-in of double-hulled tankers, the requirements to have contracts with response organizations and increased monitoring and inspection.

While the absolute number of commercial shipping accidents is very low it is nevertheless important to analyze the type of marine accidents that do arise. Data collected pursuant to the *Canadian Transportation Accident Investigation and Safety Board Act* provides important insights into the type, frequency and distribution of maritime incidents involving the transport of crude petroleum in Canada. The data indicates that the absolute number of marine occurrences involving tankers is low in Canada. Tankers were involved in 2.4% of marine occurrences across the country. The data also indicates that accidents aboard tankers averaged 10.1 incidents a year out of a total of 422.4 incidents across Canada in the five main regions. The types of incidents included close-quarters situation, mechanical, cargo trouble, personal incidents and other.

Transport Canada estimates that there are approximately 20,000 oil tanker movements off the coast of Canada each year. Of these, a total of approximately 17,000 (85%) are on the east coast. As a result of this concentration in shipping activity Transport Canada has conducted an environmental oil spill risk assessment project for the south coast of Newfoundland.¹² The risk analysis indicated that spill rates for crude oil are the greatest for small size spills while in port or at sea. In port spills are primarily associated with loading/unloading spills that occur in the harbour or at piers, whereas spills at sea could occur at any point of the tankers journey. The data also suggest that the most probable spill would be in the range of 1,590 tonnes once every 27 to 33 years. While this data from the oil spill risk assessment for the South Coast of Newfoundland may not be representative of the level of absolute risk for all Canadian coastal locations it

nevertheless provides an important insight into the risks associated with Canada's busiest oil tanker traffic region.¹³

Western Canada Marine Response Corporation information states that on average they respond to 20 (mostly small) incidents per year along the 27,000 km British Columbia coast. The two largest west coast incidents being the 2007 Burrard Inlet crude clean up of approximately 100,000 liters and the 2006 Squamish bunker oil clean up of approximately 29,000 liters. Neither incident involved a tanker being loaded, or under navigation.

We will now briefly describe some of the main policy tools used to manage shipping risks in Canada, including oil tankers.

Project Specific Risks Assessments ~ TERMPOL is the Canadian government's review process for marine terminal systems and transshipment sites that was first introduced in 1977. A federal interdepartmental process is used to develop safe vessel operating criteria and a corresponding pollution prevention program during the planning stage of a new, or modified marine terminal. In terms of risk assessment the TERPOL process normally relies on data and conclusions drawn from the proponent's studies, including the appropriateness risk models.¹⁴ However, the quality of maritime risk assessment benefit from regulatory frameworks that provides an opportunity to de-bias the expert judgements and provide opportunities for stakeholder involvement. If stakeholders do not support any of the technical assumptions, or methodology they will not support the results.¹⁵ For energy industry officials hoping that that a fact based discussion will be sufficient to garner NEB/CEAA regulatory approval the issue of public trust is not an incidental issue because Canadian are distrustful of corporate executives and the energy sector is the most distrusted industry.¹⁶

Port State Control ~ Transport Canada Marine Safety directorate administers the *Canada Shipping Act 2001* and other federal statutes and has had vigorous port state control regime in place to examine foreign flagged vessels to ensure they comply with the international requirements (i.e. MARPOL & SOLAS) and those of the flag state. This has been very effective in eliminating substandard ships and we have seen a decrease in the number of marine claims arising in Canada.¹⁷

Vessel Traffic Management Schemes ~ Canada has been a leader with respect to regulated navigation through vessel traffic management schemes. These are shore-based systems, not unlike air traffic control, where vessel controllers provide information and navigational advice but it is not prescriptive. There are a number of policy measures such as “areas to be avoided”, “traffic separation schemes”, and “recommended navigational tracks” for vessels already in place.

Compulsory Marine Pilotage ~ The *Pilotage Act* mandates compulsory pilotage in certain areas in the coastal waters of Canada. The statutes require a pilot be on board to give the master of the foreign flag vessel navigation advice. The policy intent of compulsory pilotage is to reduce the number of marine incidents that give could give rise to an accident These compulsory pilotage services have been credited with a low level of marine incidents on all coasts. Canada has over a 99.8% incident free rate of pilotage assignments: in Atlantic Canada tankers account for about 44% of the pilotage assignments and in the Pacific Region up to 7.8%.

Port Authority & Terminal Procedures ~ Prevention of oil spills at the point of loading or discharge at a marine terminal is often a prime target for management action. The importance of such safety measures in the port environment is demonstrated by the 1997 study “*Exploring Alaskan North Slope Crude Oil” Evaluation of Oil Spill Risks*”.¹⁸ The analysis revealed that most of the risk is concentrated at the major ports of entry and that the spill occurrence estimates ranged from 1% to 15% chance. However, the analysis found that the combined probabilities of an oil spill and the spill contacting land had no combined probabilities greater than 3% for any West Coast land segment. Port Metro Vancouver has advanced notification requirements for the movement of all tanker ships into the Port’s area. In addition, the Pacific Pilotage Authority continues to respond to changing commercial practices and the use of larger vessels by introducing “*Interim Operating Rules for Loaded Crude Oil Tankers in excess of 40,000 Dead Weight Tonnage*” and updated procedures for Second Narrow Tankers in 2010. What may be of concern is the fact that Westridge marine terminal has been exporting unconventional oil from Alberta for over seven years with no Transport Canada assessment of the capability and capacity to manage this product if spilled at the terminal, or by tanker.¹⁹

Oil Spill Response ~ While the absolute risk of a large oil tanker spill is low, the public has the right to be concerned with Canada's ability to respond to a "Black Swan" event that would cause a large oil spill. The federal Auditor General through the Commissioner of Sustainable Development report released in the fall of 2010 examined Canada's entire pollution prevention and response capabilities for oil from ships and not just tankers.²⁰ The report concluded that the Government of Canada's oil pollution response capability over much of Canada coast was lacking and needed to be addressed. Stephen Brown, President of the Chamber of Shipping of British Columbia has noted that industry has been proposing to the federal and BC governments the need for "significant improvement in the level of oil spill response capability on the BC coast."²¹

The inadequacy of the present oil spill response system occurred even though Canada's policy regime has in place the Regional Advisory Council (RAC) on Oil Spill Response process whereby the regional RACs report directly to the Transport Minister, or Standing Committee. Membership comprises representatives from municipalities, fishing and aquaculture groups, environmental groups, Aboriginal interests, port authorities, business and associations, shipping interests and representatives from academia.²² The ineffectiveness of the RAC process can be attributed to the fact that they have no independent budget, or political autonomy to conduct their oversight function. In addition, coastal communities and environmental advocacy groups have failed to invest their own time and financial resources to proactively contribute to the RAC process.

Tug Assistance ~ The *International Tug of Opportunity System*, which operates in the US/Canadian trans-boundary waters of the Strait of Juan de Fuca and Puget Sound, covers the coastline of British Columbia as well and provides information on the position and basic capabilities of ocean-going tugs, is also beneficial for responding to situations that may arise. These types of measures were noted in the 2003 study "*The West Coast Offshore Vessel Traffic Risk Management Project*".²³ This report determined that the risk of grounding/collision generally increases the closer a vessel transits to shore and that Northwest British Columbia was one of the areas of relatively higher risk.

4. Opportunities for Improvement

It is fair to say that the regulation of international shipping in Canadian waters is a highly developed and sophisticated regime using experienced participants working in conjunction with industry to regulate shipping in the public interest. Tankers are given closer scrutiny than other commercial vessels because of the potential pollution risk posed. Yet, there are opportunities for improvement and a methodical risk assessment.

Even though Canada has not had a major oil spill in over 30 years since the *Nesucta* oil spill off the Oregon coast that washed onto Vancouver Island in 1988 the adequacy of Canada's pollution prevention response regime is a valid policy concern. However, there are policies and procedures that can be implemented that will result in improved performance. The 2011 '*Marine Shipping Quantitative Risk Analysis: Technical Data Report*' prepared by DNV on behalf of Enbridge Northern Gateway Pipeline proposal noted that risk mitigation measures have been implemented in other jurisdictions such as the United States, the United Kingdom and Norway that further reduce the risks compared to the industry's average safety performance.²⁴

In Canada the main problem is that we have reactive maritime policy development resulting in an approach that focus on narrow technical issues. There is inconsistent funding with very little sustained independent policy input that incorporates insights from universities, government and the private sector. In addition, elements of the present safety and pollution regimes provide very low levels of public transparency. To improve sustainability an alternative approach is required.

Economic Perspective ~ There is a need to ensure adequate financial resources are available to protect coastal communities and the marine environment. Parliament could create an independent Agency responsible for conducting independent oil spill risk assessments and directing investments in spill prevention and response. It would also be possible to empower this Agency with the provision of the marine navigation services, including pilotage. A single entity using the NAV CANADA governance model could be developed to provide both the strategic direction and the technical operations the relevant Ministers in light of new shipping projects.

The private sector could partially fund the new Agency through a cargo levy similar to the one used in the Ship-source Oil Pollution Fund. Since crude oil tankers represent the source of a large-scale incident these vessels could be subject to an additional levy. In addition, higher levies may need to be made to the Certified Response Organizations so there is an adequately financed spill response capacity to meet risk from increased tanker traffic and address the Auditor General's concerns and the Government of Canada's review that is presently taking place.

Another option to consider from an economic perspective would be a requirement that in certain specific trades (the movements of bulk oil) the onboard cargo must be carried in Canadian flagged vessels, or a second registry as a legislative requirement of the coastal state and exporting nation. It would be totally within Canadian law to make this a legislative requirement and impose any restrictions or positive requirements on navigation in these Canadian tankers. For example, in the United States under the *Jones Act*, all the tankers traveling between Alaska and the lower 48 states are American flagged tankers that meet US Coast Guard requirements. The US tankers also require large escort tugs moving through US waters when in close proximity to shore.

Social Perspective ~ Mandated and voluntary best achievable practices would be one of the most effective ways to improve sustainability without resorting to an outright tanker ban. For example, Washington State has achieved a significantly lower spill rate from vessels compared to other key port states and in the US as a whole. Lower spillage rates in Washington waters were attributable to mandated and voluntary best-achievable practice programs for vessel owners and operators in the State, and continuous efforts of the Washington State Department of Ecology in such activities as inspecting vessels, monitoring vessel response and spill preparedness plans, implementing pre-booming regulations for oil transfer operations, tug escort programs and conducting spill response drills and exercises.

The effectiveness of these type of policy requirements is documented in the 2009 report "*Oil Spill Risk In Industry Sectors Regulated by Washington State Department of Ecology Spills Program for Oil Spill Prevention and Preparedness*" which noted the fact that oil tankers have historically represented less than four percent of the total spill risk while having a potential

risk potential of over 75 percent.²⁵ The study further observed that spill prevention measures at both national and federal levels have been enforced with great efficacy. Spill prevention policy measures are an important response to an increase in tanker traffic since the risk of a vessel grounding and human error are at the heart of risk exposure to the most significant impacts. Subject to technological restrictions, the vessel traffic regime could be extended out 200 miles. New technologies would allow this including HR Surface radar and space based AIS.

While the *Canada Shipping Act, 2001* (section 180) gives the federal government the necessary statutory power to take all available steps with respect to ship source oil pollution response to prevent, mitigate, or clean up pollution the Canadian approach may not be as operationally effective as the regime in the United Kingdom. In the UK the Secretary of States Representative for Maritime Salvage and Intervention has the delegated authority for one individual to take operational control of a spill, or to prevent pollution.²⁶ In Canada, we presently have some overlap between agencies and the effectiveness of our regime has never been tested in a real incident for over 30 years. More important is the lack of both industry and government investment and leadership, resources, and public communication in ensuring continuous improvement in vessel casualty prevention and response as marine traffic expands and changes in complexity.²⁷

Environmental Perspective ~ The sustainability of crude oil shipments could also be improved by allocating increased resources to the areas that matter most to coastal communities. It is important to note that Canada has accepted obligations under international agreements to create marine protected areas. The commitment is to protect 12% of its water mass by 2010. While development of these marine protected areas is complex it is fair to characterize this as a work in progress. The 2012 report *Sustaining Canada's Marine Biodiversity: Responding to the Challenges Posed by Climate Change, Fisheries, and Aquaculture* observed that Canada is nowhere close to meeting our international commitments to establish a network of marine protected areas by 2012. It is also fair to suggest that significant private and public financial commitments need to be applied to marine protected areas, coastal zone management and ocean spatial planning initiatives.²⁸

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