

Climate Change and Commercial Shipping Development in the Arctic

Project Leader

Frédéric Lasserre (Université Laval)

Network Investigators

Louise Lamarre (Concordia University); Stéphane Roussel (École nationale d'administration publique - Montréal); Claude Comtois, Suzanne Lalonde (Université de Montréal); Emmanuel Guy (Université du Québec à Rimouski); Kristin Bartenstein, Caroline Desbiens (Université Laval); Rob Huebert (University of Calgary); Samantha Arnold (University of Winnipeg)

PhD Students

Marc-André Houle (École nationale d'administration publique - Montréal); Linyan Huang, Kathy Laframboise, Sébastien Pelletier, Pierre-Louis Têtu (Université Laval); Joël Plouffe, Doctoral Student (Université du Québec à Montréal)

MSc Students

Philippe Brisson, Marie-Andrée Giguère, Cédric Pelland (Université de Montréal); Jean-François Doyon, Cécile Foissard, Marie-Ève Jean (Université Laval); Anne Dumont, Katia Hedir, Frédéric Lahrer (Université du Québec à Rimouski)

Abstract

The Arctic ice is receding, as ice extent in the summer is decreasing fast, faster than models predicted. The perspective of an ice-free Arctic in the summer is looming, with talks of riches to be exploited (oil, gas, minerals) and seaways developing across it between Europe and Asia. The perspective of a dramatic development in Arctic shipping triggered the debate in Canada as to how to assert Canada's sovereignty so as to protect the environment. But is shipping really going to develop this fast? What segments of the shipping industry could be interested in plying a seasonal, poorly mapped, unserved northern route? Will containerized cargo liners between Europe and Asia rush to the route? The weak development of shipping in the region, despite several years of talks about the perspective of the opening of the Northwest and Northeast Passages, attest to the complexity of the question. Although some segments of the shipping industry might be interested in developing new routes across the Arctic, not all will be: what will then be the speed and shape of shipping development in the region?

Key Messages

- Much of the ongoing debate regarding governance of the Arctic revolves around control of shipping that is reportedly set to increase tremendously in the region because of climate change.
- Political debates often revolve around the idea shipping will develop fast in a region where sovereignty is not well established, at times even challenged. Therefore, there is a need to assess the likeliness of this shipping expansion and its nature : what kind of ships, what kind of cargo, with what routes? The impact of climate change, sea ice melt and the expansion of emerging economies like China or Korea all stimulate the debate about a possible fast expansion of Arctic shipping.

- It appears that Arctic shipping is definitely growing, but will not explode, contrary to media reports. Traffic will remain mainly destinational (as opposed to transit) and dominated by bulk as opposed to containerized goods.
- But much fewer ships than expected does not mean the risk is nil, especially as bulk cargoes can be very dirty (oil, some ores...): regulations must be put in place and enforced, especially as the most likely driving force in Arctic shipping is natural resources exploitation: bulk ships are likely to represent most of the traffic.
- The traffic being mainly driven by destinational shipping - ships that come to the Arctic to load natural resources, or to deliver goods to local communities - there is a legal possibility for governments to better control it, as it triggers the state of the port provisions. However, monitoring, control and regulation enforcement must definitely be improved.
- A better knowledge of likely scenarios enables governments to provision for adequate policies and law enforcement tools, better than when relying on clichés about an out of control Arctic shipping expansion.

Objectives

The ongoing political debate about sovereignty in the Northwest Passage – and, to a lesser extent, the Northeast Passage – boils down to the extent of shipping that will result from the gradual opening of these sea routes.

At the present time, shipping is minimal in the Northwest Passage, and concentrated in the Barents Sea in the Northeast Passage, where traffic seems to be expanding since 2010: there is no apparent rush – for now? – from shipping companies for transit in these new straits, and the Northeast Passage seems to be much more attractive than the Northwest Passage, a fact once again confirmed in 2013.

Although these new routes are shorter than routes through Panama or Suez, shippers do not merely reason in terms of distance. Risks, reliability of service, costs of insurance, time of transit, cost of building ice-strengthened ships, availability of service along the route, regularity of ships rotations are also factors that affect the business process of selecting routes.

The first year of the research process enabled the team to highlight the fact that the shipping industry is not terribly attracted by arctic shipping routes for transit purposes: the perception of risks, high costs, and unreliable conditions of navigation has companies prefer to maintain classical routes that also present higher market potentials. The second year enabled the team to be more specific on some elements of the shipping economics in the Arctic and confirmed bulk shipping is the main segment that will expand in Arctic passages.

Fine tuning is however necessary so as to complete a more detailed and accurate picture:

- What is the likely evolution of insurance premiums for Arctic shipping?
- How is the cost matrix of shipping in the Arctic evolving? To what extent is a direct-cost analysis hinting at potential savings with shipping in the Arctic, apart from marketing advantages and problems?
- If the container shipping segment is really not interested, to what extent would the bulk segment be definitely more interested? Would it be merely for destinational traffic or potentially for transit as well?
- What is the likely shipping intensity generated by destinational traffic linked to the exploitation of natural resources?
- What is the likely destinational traffic generated by fishing?
- What is the likely destinational traffic generated by cruise shipping?

- What is the likely traffic generated by military ships - thus to what extent are the scenarios of a new cold war in the Arctic warranted?
- To what extent are large trading countries like China interested in shipping in the region?

The third research year enabled the team to further test hypotheses regarding legal aspects; political objectives nurtured by governments from Arctic countries and further away, like Japan, China, South Korea; economic factors fueling interest for Arctic shipping like tourism, fishing or natural resources; and cost/marketing issues revolving around the exploitation of Arctic shipping routes.

Introduction

The media extensively reported the idea, although with a more nuanced approach: the fast withdrawal of ice coverage could open navigation to commercial shipping in the Northern Sea Route (NSR) north of Russia, as well as in the Northwest Passage (NWP) and all Arctic waters. This development could challenge Canadian and Russian governments inasmuch as both Ottawa and Moscow claim they have sovereignty over their Arctic straits and are entitled to controlling shipping in their Arctic waters.

Several paths for an increased shipping can be considered. A navigable NWP could become an important route for transit shipping between Europe and Eastern North America and Asia, and this scenario is the most often quoted by the media and government circles, because of the absence of transit fees, whereas fees are imposed by the Russian Government for transit along the NSR.

However, recent facts point to a different picture:

- The NWP remains largely ignored for commercial transit. Only research, cruise ships and small pleasure boats use it. The August 2013 transit of the bulker Nordic Orion attracted much hype, but

this single commercial transit cannot hide the fact that, for the short term, shipping companies do not rush to the NWP. The NSR, to the contrary, is witnessing an expanding traffic since 2010, with 46 official commercial transits in 2012 and 71 in 2013. Not much when comparing with the Suez Canal (17 000 transits in 2013) or Panama Canal (14 500 transits in 2013) traffic, but progressing on a steady pace.

- Destinal traffic is by far the fastest developing cause of traffic at the moment. Hydrocarbon exploitation as well as mining in the Arctic, increasing traffic to bring supplies and machinery to mines, and transport back valuable minerals to their markets (oil, gas, gold, diamonds, silver, zinc and copper) in a time of increased demand for natural resources because of a steady economic growth in China and India, is likely to be a powerful engine for growth. Expanding traffic along the Northern Sea route since 2011 attest to this trend: most ships went to the Eurasian Arctic (northern Norway, Russian Barents and Kara Seas) to load resources and then sailed to final markets, Europe or Asia.
- Fishing also seems to be a major economic stake as Norway, Russia and Greenland try to maximize the value of fish stocks: the number of trawlers is showing a significant increase around the coasts of Greenland and Baffin Island, for instance.
- Tourism is also expanding fast in several Arctic regions, Greenland, Svalbard notably. However, cruise traffic in Arctic Canada is remaining low. What can explain the fact that cruise traffic fails to expand in Canada as it did in Svalbard or Greenland for instance?

Economic incentives for increased navigation are thus high; with natural resources to exploit in a vast area, the need for monitoring and surveillance is heightened. There is fear that Canadian assertions of sovereignty and desire to monitor traffic and exploitation, already questioned in the past by the United States, could be seriously challenged now that the economic and political prospects for navigation are real. However,

these fears could prove misplaced, as transit traffic is remaining sketchy in the NWP, and as new actors like China and Japan asserted they did not intend to question Arctic coastal claims to internal waters.

Activities

1. *By researcher:*

Stéphane Roussel

Organisation of the conference « Le Canada au Conseil de l'Arctique », Avril 26, 2013, ENAP, Montreal.

Preparation of a research grant proposal (SSHRC) on the theme of the militarization of the Arctic.

Ongoing research on institutional dimensions of the Arctic.

Suzanne Lalonde carried on her research on the general international legal frame of international shipping, publishing several papers on the IMO and its role in Arctic shipping evolution. She also organized workshops and is editing a book on international law and the Arctic. With F. Lasserre, she participated in a course prepared and delivered by Whitney Lackenbauer (University of St-Jerome's and NI) on the Arctic for the Canadian Institute of Foreign Service in December 2013.

Kristin Bartenstein pursued research on international regimes with a special view with Arctic governance. She published a paper with a comparison of Baltic, Antarctic and Arctic legal regimes. She also studied the Arctic Council's achievements and work - research that led to a chapter in Suzanne Lalonde's book co-edited with Ted McDorman. She also went ahead with the assessment of the regional and international legal frame of shipping, natural resources exploitation and regional co-operation.

Claude Comtois: ongoing research about bulk logistics systems; port systems competitiveness; transportation

infrastructure governance. This research gives the global frame in which shipping firms evolve and design their specific policies regarding the Arctic.

Claude Comtois and Emmanuel Guy carried on their research projects with Transport Canada on the local structure of shipping in Canada's Arctic region. E. Guy is a member of NEXTAW (Network of expertise on Transportation in Arctic Waters), an expert network on shipping in the Arctic set up by Transport Canada with a view to providing expertise to territorial governments of Nunavut and Northwest Territories.

Lasserre, F.: the shipping cost-analysis simulation platform was completed and published in January 2014. However, the research on insurance companies' policies regarding Arctic insurance (with two graduate students) is proving difficult to develop, precisely because of the ongoing solidification of policies by insurance firms that are still grasping with the assessment of risks facing ships navigating Arctic waters.

Lasserre, F. and Boyer, A.: Ongoing research about the development trends of fishing in the Canadian Arctic. A. Boyer finished his Master's thesis; two articles in specialized journals were published.

Lasserre, F. and Têtu, P-L.: Ongoing research about the development trends of cruise tourism in the Arctic, especially in the Canadian Arctic. P-L Têtu's masters thesis completed in Spring 2013. A chapter and an article on Arctic cruise tourism were published in August 2013.

Lasserre, F. and Huang, L.: ongoing research on China's policies regarding the Arctic. Several interviews with Chinese shipping firms were conducted and others are planned.

Lasserre, F. and Têtu, P-L.: PhD begun in October 2013 on Chinese mining interests in the Canadian Arctic and Greenland.

Lasserre, F., Pelletier, S.; Doyon, JF., Huang, L., Alexeeva, O. (associate researcher) : Ongoing interviews and visits with shipping companies, port authorities and shipyards (field trips paid for by FQRSC and SSHRC):

- France, Germany, Russia
- China

Louise Lamarre pursued the production of the team's film on Inuit communities and their changing world. The year 2013 was dedicated towards searching new partners and writing funding applications to ensure the completion of the film. We set up a SSHRC Connexion grant proposal.

On the partnership side, we have secured 4 important external partnerships:

- Vision Globale, a post-production house committing an investment of \$10 800;
- La Cinémathèque québécoise, committing to give us high visibility for the opening of the film, the press conference and the round-table we are planning to organize in its well established and renowned premises;
- K. Films Amérique, a film distribution house, committing to distribute the film. An investment of \$10 000 that will insure the international visibility and diffusion of our project.
- In the same spirit Concordia University wrote a letter reassuring its commitment to the project in giving us access to the equipment required for the completion of the work.

Concordia's support to the completion represents \$30 000.

While editing and producing the film, it came to our attention that it would really benefit from a larger Inuit visibility, as well as some precisions about culture and political identity. So we carried on with 3 more interviews.

2. *Research synergy*

Ongoing development of core area research dimensions:

- General politic and economic frame for globalized shipping firms (Lasserre, F., Guy, E.): a book chapter was submitted.
- Modelization of cost structures of ships operating in the Arctic (Lasserre, F.): an article was published.
- The development of the cruise tourism industry in Canada (Têtu, P-L., Lasserre, F.): an article was published.
- The development of the fishing industry in Arctic Canada (Boyer, A.): one article published, one submitted.
- The development of shipping insurance policies products for the Arctic (Lasserre, F.): ongoing research; an article is being prepared. A coordinated subprogram on the impact of piracy in the Gulf of Aden on shipping policies and insurance tariffs in being designed.
- Natural resources exploitation and transportation: what risks? What are the strategies of bulk shipping firms? (Doyon, J.F., Pelletier, S. and Lasserre, F.). Two articles are being prepared.
- What is the reasoning of mining firms when designing logistical schemes for exploitation of sites inland: developing a sea window or developing an overland link with existing onland networks? (Lasserre, F. and Laframboise, K.)
- The increase of local communities servicing by the shipping companies like Desgagnés or NEAS (Turmel, M., Guy, E. and Comtois, C.). Reports and Proceedings published.
- The impact of mining development on port infrastructure and destination shipping (Comtois, C., Guy, E., Lasserre, F., Laframboise, K., Turmel, M.).
- Cost assessment of year-long shipping in the Canadian Arctic, in partnership with Fednav: an article was prepared and submitted.

- A comparison of developing traffic along the NWP and the NEP (Lasserre, F., Alexeeva, O.): a chapter submitted.

Parallel ongoing development of research about global environment dimensions:

- Legal developments regarding Nordreg as well as international legal aspects like the Polar Code (Bartenstein, K., Lalonde, S.). What is the regulatory framework on Arctic shipping going to look like?
- Legal and political developments regarding the controversy around the status of the Arctic passages (Lasserre, F., Lalonde, S., Bartenstein, K.): a book chapter was accepted, an article published.
- China's and Japan's interest about the Arctic (Alexeeva, O., Huang, L., Lasserre, F., Huebert, R., Lackenbauer, W.). Three articles published; two conference proceedings published. A specialized article (Lasserre F. and Pelletier S.) on the irruption of the Chinese icebreaker Xuelong in Canadian waters. A SSHRC research grant proposal on China's pArctic policies was won (395 000 \$).
- The US and the European Union interest and strategic position regarding the Arctic (Plouffe, J., Thieffry, A.)
- The so-called militarization of the Arctic : towards a real arms race? (Roussel, S., Lasserre, F., Lackenbauer, W. and Huebert, H. - cooperation with Lackenbauer and Huebert's ArcticNet research program). An article was published; a research proposal submitted with SSHRC.

Results

Shipping

The summer 2013 transits of the bulkier Nordic Orion across the NWP, and of the Chinese multipurpose ship Yongsheng across the NSR, revived media interest

for and predictions of future massive Arctic transit shipping. Though these events clearly underline the technical feasibility of Arctic summer transits is no longer an issue for ordinary shipping firms, most commentators failed to observe a few facts:

- Nordic Bulk Carriers, the owner of the Nordic Orion, clearly stated that the transit was profitable because there were no transit fees along the NWP, even though Canada provided an icebreaker escort. Should Canada decide to implement transit fees, Nordic Bulk Carriers feels the transit would not be profitable.
- Cosco, the Chinese owner of the Yongsheng, is assessing the profitability of Arctic transits, but never said it was sure to develop this service. Far from being assertive and determined to develop Arctic shipping, Chinese shipping firms are still in the cautious process of assessing to what extent such ventures may be profitable.
- Commercial transit remains minimal in the Northwest Passage (zero in 2012, 1 in 2013); it increases along the Northern Sea Route, but mainly driven by destination resource traffic from Northern Norway and Siberia (34 ships in 2011 along the NSR, 46 in 2012, 71 in 2013).
- Accidents happen, as the tanker "Nordvik" was struck by ice while sailing in the Matisen Strait to the north of the Taimyr Peninsula on September 4, 2013. The vessel, which was loaded with diesel fuel, struck an ice floe and started taking in water before being to Murmansk. Caution must remain a priority for regulatory authorities (Marchenko 2013).

We developed a cost analysis model so as to assess Arctic shipping transit (Lasserre 2014). The cost analysis we carried on capitalized on existing models and on the more than a hundred interviews with shipping companies, in Europe, North America and Asia. It had been underlined that a high variability of the break-even point and wide discrepancies between simulations conducted up to now can be noticed

(Lasserre 2014). A new simulation we set up based on 12 published simulations we gathered in the literature and on shipping data. This new simulation underlines the fact that summer transit can be profitable, if the load factor is high (economic variable), the ship not too ice-strengthened (higher capital and exploitation costs), and if the origin-destination couple of ports is not too southerly. Winter transit can barely be profitable on a regular basis except for niche markets like the servicing of mines with a captive market - the load factor will therefore always be optimal.

The model indicates Arctic transit may indeed be profitable for specialized shipping firms with ice-strengthened ships. That the technology exists to develop market niches for Arctic shipping, nobody doubts (Bourbonnais and Lasserre 2013). The issue is really about profitability and the interest form the shipping industry varies depending on the regional conditions. The model also underlines that shorter routes, if indeed an advantage, are not in themselves enough to make up for other costs - capital costs for ice-class ships ; experienced crew; higher maintenance and exploitation costs; insurance costs. It is in line with arguments that were already developed by shipping firms (Lasserre and Pelletier 2011, Huang et al. 2013).

As for the reported growing Chinese interest for shipping routes, it appears this interest is real, but mainly fed by the government and the research community. During a series of direct interviews conducted in September 2013 with 23 Chinese shipping and forwarding companies, it appeared that few expressed a real interest for Arctic shipping. Only two, including COSCO, answered they considered developing Arctic shipping. Moreover, COSCO, a major shipping group, reckoned the profitability of Arctic routes was questionable, whereas the other firm displaying an interest was rather focused on Arctic destination traffic (transporting Arctic natural resources from Siberia to China).

In the cruise shipping industry, the picture is strongly contrasted between Greenland and Svalbard, for

instance, where traffic is growing at a strong pace, and the Canadian Arctic, where growth is present but very slow, with about 13 cruises per year, 20 in 2008 but 11 in 2012 (Lasserre and Têtu 2013). We conducted a survey with cruise tourism companies on their interest in the Arctic. The vast majority of the 47 companies that agreed to participate indicated little interest in the Canadian Arctic cruise market, rather focusing on Greenland, Svalbard (with about 60 cruises for each of these two markets) or the Antarctic. Two operators also stepped out of the Canadian Arctic market in 2012, Quark Expeditions and Polar Star Expeditions. From these interviews, it appears the Canadian Arctic cruise market is set to develop, but at a much slower pace than expected.

The fishing industry displays a growing number of trips to the Canadian Arctic, but with a slowly growing catch and few different ships. The industry is taking advantage of the receding ice to multiply the number of trawlers visits to Canadian Arctic waters, but with few newcomers into the market (Boyer, Lasserre and Têtu 2014). This is because most newcomers are small trawlers with limited logistical capacities, that must therefore multiply voyages back and forth instead of staying for long periods in Canadian Arctic waters.

Regarding the development of service to communities, this is a segment of the market that is indeed growing and that fuels shipping in the Canadian Arctic. However, this development is not without challenges for shipping companies. In Nunavut and Nunavik, shipping firms NEAS and DTI are facing severe conditions when trying to implement additional service at the beginning of the shipping season, in early summer, or at the end in Fall, such as sea ice, winds, extreme weather and improper marine charts. The lack of marine infrastructure is among one of the most important problems. Due to this lack, shipper's deep draft vessels (6-10 m) are anchored at sea off communities. Barges, tugs, tractors and other required equipment to carry goods from ship to shore are first unloaded using ship cranes. Then, goods are loaded one by one on these barges. When full, they are pushed ashore by tugs where goods are unloaded and carried up to the

high water mark by forklift tractors. Tugs and barges then go back and forth from ship to shore until all goods have been unloaded. In most communities, maneuvers are halted at low tide (Turmel et al. 2013).

Regarding the possibility of year-round shipping, already the case for some mine servicing by Fednav for instance in Arctic Québec, it is unlikely that we will see year-round transit navigation in the Canadian Arctic, despite major technological innovations like the azipod double-acting ship.

First, delays are too unpredictable for the container shipping industry, which generally works on schedules that leave little room for flexibility, a feature several shipping firms explicitly underline when considering navigation in the Arctic (Lasserre and Pelletier 2011).

Second, for winter navigation, high ice-class ships, above the classical Baltic 1A or 1AS, would be required to make this transit. These ships are costly, and this significantly reduces the profitability of distance reduction.

Third, and more importantly, ice conditions in the routes in the Northwest Passage are still too severe even for ice capable ships to cruise through the route at a reasonable speed and in a predictable, considering the great distance that they would need to do. Even promoters of shipbuilding technology reckon that winter navigation remain difficult. Even with first-year ice prevalent, sea ice in the Arctic is not comparable to ice in the Gulf of St. Lawrence (Bourbonnais and Lasserre 2013).

In the insurance sector, most major insurance firms involved in shipping coverage have worked out a policy position regarding Arctic shipping. If many decided not to go, several however are still in the process of grasping with risk assessment calculations. This ongoing process accounts for the difficulty of defining a clear picture of the industry's position regarding Arctic shipping, and of outlining tariffs and premiums for Arctic shipping. The baseline seems that crew must be experienced and ships fit for Arctic shipping, ie with ice-class and suitable equipment.

Premiums are always higher than for classical routes, but the scope of variation is still wide and very much depends on the risk appreciation by the insurance firm.

Political and regional frame

The often described arms race seems here again to be a far-fetched media-developed image. Indeed, Arctic coastal States do develop military patrols and the tools they need to enforce their sovereignty over sea expanses that were barely patrolled before ice melted. Military strategies do hint at the need to better control these areas, so as to prevent illegal natural resources exploitation, pollution, illegal shipping that would not respect regulation. But they do not underline tensions that would account for a military build-up. Quite the contrary, negotiations seem to prove fruitful, after the 2010 border agreement between Norway and Russia in the Barents Sea, and the 2012 agreement between Canada and Denmark in the Sea of Lincoln. Fears of a military build-up have abated in the media as the government resorts less often to the rhetoric of the foreign threat to sovereignty (Genest and Lasserre 2013).

China is increasingly described as very assertive in the Arctic and seems to be looming as a potential threat in the media accounts. Analysis of the Chinese policy underlines that if China is indeed interested in Arctic issues:

- Its interest is mainly focused on natural resources, which it intends to buy on the regular market, and for which the Arctic is a market among several others China is actively exploring (Huang et al. 2013b, Alexeeva and Lasserre 2013).
- Shipping is certainly not the main interest for China as only one Chinese shipping firm expressed interest. China seems more concerned Chinese ships will be allowed to proceed should its shipping companies wish to develop Arctic routes, rather than entering sovereignty debates that could very well prove counter-productive for its own sovereignty disputes (Huang et al. 2013, Alexeeva and Lasserre 2012, 2013).
- A survey with 25 Chinese shipping firms shows the interest for Arctic shipping is very low, as only 2 firms responded positively (Huang et al. 2013b).
- China also wishes its voice to be heard and intends to play a role in international fora to be consistent with the international status it aspires to, but that does not mean it wishes to question the sovereignty of Arctic coastal states (Alexeeva and Lasserre 2013).

The Polar Code is still in the process of being negotiated. Canada's strategy of sovereignty enforcement rests mainly on the claim of internal waters justified by a historic title, a strategy that could prove weak if officially challenged. This does not seem to be the case, as the US seems satisfied with merely refusing to recognize Canada's claim. Washington's position is justified by the fear of creating a precedent, but the analysis shows this fear is largely rhetorical, as very few straits in the world can indeed be legally compared with the situation that prevails with the Northwest Passage.

Discussion

International Law

The 2009 IMO Guidelines for ships operating in polar waters, the only applicable general document providing a set of rules regarding norms for commercial shipping in the Arctic, contain several significant provisions and represent an important step towards an improved regulatory framework for an emerging segment of global shipping, that which takes place in ice-infested waters (Jensen 2008). However, most researchers agree that guidelines, because of their non-binding form, provide only a limited contribution to maritime safety in the Arctic and should only be considered as a first step. Ongoing negotiations are taking place so as to define a mandatory Polar Code (Bartenstein 2012).

In the international law field, it appears Canada has been a key player and remains an important collaborator in the development of legal regimes for the Arctic: Canadian agencies, for example, played a lead role in the drafting of the IMO's Polar Guidelines and are continuing their decades'-long efforts to transform them into a binding code.

Canada was also a driving force behind the creation of the Arctic Council and remains today a strong supporter of the Council's work. But in regard to the Northwest Passage, the foregoing analysis of Article 234 and the Particularly Sensitive Sea Areas mechanism has revealed that if the protection of the Arctic marine environment is the desired end, then the application of Canadian rules and regulations and especially, their timely and effective enforcement by Canadian authorities, remains the most effective way of protecting the Northwest Passage. Suffice is likely not to rely on legal mechanisms, despite their being useful: their clear enforceability is key. From this point of view, developing infrastructures and equipment to keep the possibility to conduct search and rescue operations as well as constabulary/interception interventions, in line with the political resolve to use these tools, is important (Lalonde 2013).

Australia implemented with Papua New Guinea, a mandatory piloting scheme that was welcome with a lot of controversy. The reaction to Australia's Torres Strait scheme must be a red flag for Canada in regard to the Northwest Passage. Indeed, problems arose within the various committees of the IMO not because of the nature of the measure proposed—compulsory pilotage—but because Australia and Papua New Guinea wished to apply and enforce it in an international strait. The Torres Strait experience reveals that despite a growing awareness of the vulnerability of the planet's marine ecosystems, nothing can shake the primacy afforded the right of transit passage by the LOSC: in straits used for international navigation, all ships and aircraft enjoy the right of transit passage, which shall not be impeded. While such a rule is undoubtedly necessary to avoid abuses and the erosion of the core value of

free access to the seas, it has become, regrettably, for many countries, an absolute which cannot admit of substantively justified and carefully designated exceptions, even with international monitoring. A Particularly Sensitive Sea Areas designation would therefore offer very little protection to the Northwest Passage if it were designated an international strait rather than under Canada's sovereign control (Lalonde 2013).

As far as this enforcement is concerned, fears that the United States might strongly object because of their fear of a precedent are debated. This fear is used as the main reason for Washington's refusing to recognize Canada's claim over the NWP. The United States has been consistent in protesting limitations to shipping in major straits throughout the world, a number of points must be noted.

- There are, in fact, very few cases where recognition of Canadian sovereignty over the Northwest Passage or some other type of jurisdictional arrangement could be invoked as a precedent and as such, unsettle or cast doubt on existing regimes. The only potential areas of concern appear to be the Northeast Passage, the Qiongzhou Strait and Head Harbour Passage, and to a lesser extent, the Japanese, Piombino, Palk and Kerch Straits.
- Most of the strategic straits referred to in the academic literature as potentially influenced by the Northwest Passage precedent, are simply not relevant. Such straits are not within the internal waters of the States bordering them and are therefore not subject to their exclusive control. More importantly, these major maritime highways are now unquestionably considered to be international straits to which the regime of transit passage applies. Their designation as international straits, and the legal rights which flow from such a designation, can no longer be reasonably questioned, irrespective of the outcome of the Northwest Passage case.

- The discrepancy between those cases where the Northwest Passage could be used as a precedent in favor of a coastal State, but are not referred to in the literature, and those cases put forth but which appear to be irrelevant regarding a possible precedent remains problematic. Political reasons might well be the driving factor. Another possible explanation could be that Washington is not in fact worried about creating a potential precedent for specific cases, but has rather chosen to adopt a general, conservative policy, fearing that a Northwest Passage under Canadian sovereignty could be another illustration of “creeping jurisdiction”, an undesirable infringement on the freedom of navigation (Lalonde and Lasserre 2013).

The melting of sea ice enables observers to consider the development of fisheries in the Arctic Ocean even if, presently, there is no proven exploitable stock beyond the Barents Sea, because of a poor knowledge of Arctic marine ecosystems. It remains to be seen to what extent these potential stocks would be economically profitable because of their remoteness and the market acceptance of the species that would be exploited.

The Arctic coastal States agree on principle that international regulations are necessary to manage and control commercial fishing. The precautionary principle, however, shows that these international regulations are not sufficient and suggests that measures be taken to regulate the exploitation of fish stocks in this region of the world. However, disputes between the Arctic coastal States and the complexity of setting up a regional fisheries organisation largely limited the outcome of ongoing negotiations between them (Boyer and Lasserre 2014).

Domestic and international politics

Despite rhetorical outbursts, initially over the American refusal to recognize Canadian sovereignty over the NWP, then about a possible Russian threat (focused on the issue of extended continental shelves), the discourse on Arctic sovereignty from the Canadian

government has evolved over the years. It appears that in the discourse produced by Ottawa from 2006 to 2009, the Canadian government arguments over the Arctic have shifted from a mainly military rhetoric to find a balance between legal, environmental, socio-economic policy and military dimensions. However, identity arguments remain very present and try to find an echo in the discourse on Canadian national identity. The argument developed by the Conservative government is simple: Canada's sovereignty is intrinsically linked to national identity, in which the Arctic plays a fundamental role, and the government is ready to preserve its integrity. In contrast, the environmental arguments are less present, but are useful to justify Canada's sovereignty indirectly. Here, despite the lack of interest from the Conservative government in the fight against climate change, the environmental fragility of the Arctic region justifies the need for Canada to recognize its sovereignty in the Arctic. Thus, it is apparent that the discourse on Arctic sovereignty can serve other functions such as strengthening the sense of national belonging and influencing voters while portraying the government as a staunch defender of Canadian sovereignty (Genest and Lasserre 2013).

These conclusions are in line with other research carried on that underline the fact that the so-called arms race in the Arctic has more to do with media hype than reality. Russian ambitions in the Arctic may be very real, but they are still far from being realized and they are not necessarily implying the will to confront the other riparian Arctic States. Russia may nourish high ambitions for its Arctic and armed forces, but plans to recreate a powerful navy, to lay down new icebreakers to replace a declining fleet, to establish new FSB border control units and search & rescue units are a daunting task; it is hard to imagine that Russia has the financial, administrative efficiency and technical capacity to meet these objectives. Not only is Russia's policy in the Arctic far more nuanced than often depicted in Western discourses, but the trend in military equipment of its navy and air force does not underline any deliberate aggressive build-up in the Arctic, as Moscow now seems to focus on sea nuclear

deterrence (SSGN) and coastal defense. The other Arctic Ocean riparian countries have also developed similar Arctic policies, but they depict a posture that is no more aggressive than Russia's. They have also begun to upgrade their military equipment and military doctrine with a view to a better control of the Arctic, but it is in an orderly manner that is not reminiscent of an arms race. Rather, the equipment and doctrine renewal point toward a securitization of newly opened maritime spaces that each State wishes to control.

The relative size of the deployment of the States that maintain a military presence in the region seems rather proportional to the importance they attached to the Arctic in the national identity discourse. The overall picture of Arctic military evolution is one of limited modernization, limited increases or change in equipment, a picture that certainly does not warrant the image of a renewed arms race. Some of these changes, like the strengthening of the Canadian Rangers or the moving north of Norwegian units and headquarters, have little to do with power projection into contested areas, but are rather for the patrolling of recognized national spaces. There has indeed been some modest military buildup by the Arctic states, and often the new equipment was replacement, not expansion. But that buildup hardly signals aggressive designs. Rather, it seems little more than a prosaic response to expanded jurisdictional space with the melting of the ice, and continued resource development (Lasserre, Le Roy and Garon 2013).

Shipping

Many models have been published trying to assess the potential profitability of commercial shipping along Arctic routes, mostly to study transit shipping. A relative majority concluded the Arctic routes are likely to be profitable. However, the assumptions, simplifications inherent to any modelling differ widely.

With the model we built, using partial conclusions from a set of 12 studied models, a new one where we tried to take into account market considerations, a methodological approach that is less prevalent in

past models that usually focus of theoretical cost-analysis. This methodological approach is also justified by conclusions of a large survey conducted with the shipping industry (Lasserre and Pelletier 2011).

It appears that:

- Official Russian tariffs for the NSR make any route prohibitively expensive; but the Russian authorities do intend to enforce a very flexible real tariff so as to attract business, a point already illustrated with several bargain tariffs conceded by the Russian authorities. It seems official tariffs are an indication but that they are open for negotiations.
- Summer transit to Shanghai is usually not cost-competitive for a liner service, unless fuel costs are higher and, more strategically, the load factor is much improved. Fuel costs in themselves are not important enough to account for the profitability of Arctic routes.
- Transits to Yokohama, however, are more profitable with Arctic routes, along both the NSR and the NWP, despite lower load factors. However, if transit speed along the Arctic segments proved to be slower than assumed in this simulation, it would question the profitability of the service.
- Year-round liner service is never profitable, even to Yokohama, neither along the NWP with a dedicated powerful PC4 ship, nor with a 1AS ship along the NSR with an icebreaker escort. The severity of Arctic conditions suggests that it is more profitable to look at the Arctic as a destination, not as an area of transit. Destinal shipping could likely lead to infrastructure development within the region, which would probably not be the case with transit traffic. Arctic shipping interest is driven by the market: what makes winter trade profitable is the value of the commodity. Once this parameter is confirmed, then one needs to look at the feasibility of the route to determine if the project is worth moving forward.

- Rather than being directly dependent on the variable of fuel cost, the profitability of Arctic routes depend on average transit speed, that determine the number of possible rotations, and on the load factor, underlining the importance for shipping companies of securing a large enough market for a direct transit route to make a profit. The simulation thus indirectly confirms fears many expressed during the survey we conducted: without a strong load factor, Arctic routes will hardly be profitable.

As for infrastructure problems that hinder the development of regular service, a reflexion was conducted with shipping firms and regional governments in northern Canada. To find a solution to this issue and improve the northern supply chain, it is often proposed, in the literature and in government reports, to provide local communities with improved marine infrastructure. So far, two development models have been put forward. The first one, light infrastructure (LI) to support unloading at anchorage, includes a breakwater and an unloading ramp to allow easier handling of goods by barges. The second one, construction of deep-water ports (DWP), speaks for itself. Both options have shortcomings and advantages. Regional governments usually favor DWP because of the growth potential they come with, but balk at the building costs. The idea of coupling community ports with mining ports arose from this dilemma, but then the question is to what extent a port that could service a community can be of any use for a mining operation (Turmel et al. 2013). LI also have advantages: cheaper costs, local users' safety in Nunavik and development of commercial fisheries in Nunavut are the main advantages seen in building LI (see also Boyer et al. 2014). Although significant in Nunavik, objectives related to a steady and potentially growing supply seem less relevant to policy makers in Nunavut. Objectives related to supply will be met more appropriately by a DWP according to the government of Nunavut's discourse. DWP model is also considered by stakeholders as a means of enhancing economic development in local communities. In Nunavik, DWP seems to be set to support the mining industry. If built, it will be useful as well to facilitate supplying.

Finally, LI is generally aimed at targeting local communities' uses and needs (safety, subsistence fishing, commercial fishing and traditional way of life). Community resupplying is included as well in this because its operations and techniques were developed to be adapted to available infrastructure. Thus, LI is planned to be suited to current needs. As for DWP, according to stakeholders' discourses, they are destined to accommodate North's new visiting vessels such as cruise ships, navy ships and mining industry's bulk ships. While the magnitude of past developments dictated the construction of modest infrastructure, future users, in greater number, might justify DWP implementation to policy makers. However, these projects are still under consideration or on the drawing board.

The analysis of stakeholders' measures and objectives has led us to draw interesting conclusions. Impacts of each of these models on marine carriers' activities helped assessing their relevance. To sum up, these following statements can be made from this study:

- The LI development model is favored in most cases because even though benefits to carriers are low, incurred costs to policy makers are almost null.
- The DWP development model is considered in most cases as a means to facilitate economic development on a large scale. However, benefits for marine carriers are similar to LI but incurred costs to policy makers are much higher. In the end, cost-benefits ratio shows that the LI model is more interesting than the DWP model for marine carriers and policy makers.
- There exists a significant difference between marine infrastructure related public policy development in Nunavik and Nunavut. The former has shown more progress and there is more consistency between objectives and measures set up by its different stakeholders. Selected measures are adequate to meet the needs of carriers and other users and are, on top of that, suited to prevailing conditions in Nunavik.

Finally, unlike Nunavut, actors in Nunavik are collaborating closely.

- Cruise shipping firms prefer DWP as this greatly facilitates onshore excursions and provides for a safer environment (a harbor where to dock) in case of a minor accident, before the damage becomes a major problem.
- Commercial marine carriers favour LI implementation, because it facilitates their operations whilst enabling them to keep using the same techniques and equipment. Nowadays, they operate in a niche market carved around their expertise built over the years. A DWP would change the situation and allow new companies to enter the market and thus take a part of the market share currently belonging to NEAS and DTI. It therefore seems appropriate to think that marine carriers have no interest in promoting the development of DWPs (Turmel et al. 2013).

The importance of infrastructures was stressed by the cruise industry too. It is unlikely that cruise tourism in the Canadian Arctic will experience the rapid growth predicted by some researchers and by the media. Most of the operators surveyed communicated their disinterest in expanding their business activities or to enter the Canadian cruise tourism market, with only three signalling their interest. Several underlined what appears to them to severely hinder growth potential. To summarize, an advisor to the sales manager of Beluga Expedition & Adventure made in 2012 an interesting remark with regards to the Canadian cruise tourism market: “It is not really a growing market, but more of a steady one”. Similarly, we consider that a diversification of cruise itineraries and a modest increase in cruise tourism activities in the future are more realistic expectations, yet we might not witness the actualisation of these expectations without significant development of marine infrastructures and a revision of regulations in the Canadian Arctic waters.

Despite the moderate traffic we observed, questionable behaviour was observed from cruise ship operators.

Several cruise ships with a poor ice-class ventured in waters where, according to the Arctic Waters Pollution Prevention Act - AWPPA - they should not belong. They circumvented the regulation by carrying less than 453 cubic meters of fuel but did respect Nordreg regulations and regularly reported. However, large ships like the 500-passager MS World that cruised the NWP in 2012, with a poor 1C ice-class, are taking considerable risks given the poorly charted waters and the drifting ice (Lasserre and Têtu 2013).

Insurance companies point out the small market size of Arctic insurance to explain why general industry guidelines have not been established yet. A few companies have been in the market for long, like Osborn and Lange, CNA or Skuld, and a few others have recently entered the market, but the number of players remain low as competition would be too fierce for a service where risks remain to be assessed precisely by actuaries. Insurance firms underline costs are high (premiums between 30 and 75%) and stress the main factors in insurability are the ship architecture (ice strength), the experience of the crew, the experience of the shipping company with Arctic navigation. Therefore, there is an insurance cost premium for a newcomer to the Arctic shipping market, as its navigation record would be blank of course.

China, reportedly nurturing a growing interest for Arctic shipping routes, proved to be more in the midst of a theoretical debate among government officials and academics, rather than boasting several shipping firms in their starting blocks. Indeed, several shipping firms said they thought there was a real potential for Arctic shipping since the Arctic routes were shorter, both for bulk transportation of natural resources as well as for liner shipping. However, analyses remain sketchy as no firm declared they had done an extensive cost/benefit or SWOT analysis, because there did not seem to be any short-term advantage. Among the elements of explanation the surveyed companies gave to justify their lack of interest or involvement, figured prominently the following factors:

- High investment cost required for the purchase of ice-strengthened ships.
- Market constraints like just-in-time and ship size that limit economies of scale.
- Arctic market too small for profitable route that enable quick return on investment on ice-strengthened ships.
- Physical risks and insurance costs.

Besides, the analysis of official speeches and declarations stresses another picture. The Chinese government multiplied declarations regarding Arctic resources rather than Arctic shipping, even recently (Alexeeva and Lasserre 2012, 2013). The government and Chinese shipping firms thus seem more interested in access to Arctic natural resources, an access the Arctic shipping routes may provide, rather than transit shipping. From this point of view, Chinese shipping and chartering firms reason on a very similar way as other globalized shipping firms from Europe, North America or Asia, as attested to by Lasserre and Pelletier (2011).

It remains to be seen to what extent COSCO's experiment is going to be assessed as fruitful and to what extent other Chinese shipping companies will develop the view that Arctic shipping can bring them interesting market opportunities. For now, it seems this potential is barely considered as most surveyed transport firms appear not to be interested in Arctic shipping. Arctic shipping is viewed as potential, because of shorter distances and fuel savings; but when it comes to developing actual service, most Chinese shipping firms presently balk at the risks and required investment. It thus seems that either there is a wide discrepancy in analysis between shipping firms (business circles) and government circles regarding the interest of Arctic shipping; or that Arctic shipping is not at the core of the interest the Chinese government nurtures towards the Arctic: natural resources and voicing its views in diplomatic institutions like the Arctic Council would then appear to be Beijing's priorities.

Local navigation for general cargo is already expanding and will probably continue to do so. Natural resources exploitation (oil and gas, metals, and other minerals) is likely to bounce back and grow in a matter of a few years in the Arctic, sustaining the continued development of traffic at local ports. Although this type of traffic will be subject to country port regulations, it will also be potentially more polluting than transit traffic as it will carry concentrated ores or hydrocarbons.

As far as transit traffic is concerned, media reports claiming that the Northwest Passage is on the verge of becoming a super seaway are farfetched. Bulk shipping is more likely to be interested than container shipping in testing the profitability of Arctic transit routes. Local mining traffic represents a greater hazard as its cargo is potentially more polluting.

Conclusion

Port infrastructures in Arctic Canada: debated for many decades, as the examples of Nanisivik or Iqaluit illustrate, they could provide a useful impetus for the development of the fishing industry, the improved servicing of local communities, and encourage a partnership between mining firms and local governments. However, the implementation of deep-water port schemes remains difficult and costly, which leads local government to prefer light infrastructure development.

Growth of Arctic traffic: despite media reports underlining the advent of large-scale transit shipping, it appears shipping firms, whether from Europe, North America and even Asia, remain very prudent in their evaluation of the market potential of Arctic shipping routes. From this point of view, Chinese shipping firms are very much in line with other Western counterparts, as they appear to use the same kind of arguments in their assessment of risks and potential benefits.

The profitability of scheduled services along Arctic routes remains debatable despite shorter distances.

The risk inherent to this type of shipping remains serious to the point that Lloyd's repeated twice in 2012 and in 2013 that Arctic seaways remained a navigation challenge.

There may be niche markets that some shipping firms may take advantage from: the servicing of mining or oil and gas operations in the Arctic (destinational traffic) ; special projects necessitating a few transits to transport oversized elements of equipment. Indeed, traffic keeps growing in the Arctic, largely along the Northeast Passage, and this growth is mainly fueled by destinational traffic.

Cruise tourism is growing in Greenland, Svalbard, but not so much in the Canadian Arctic, where it seems to remain stagnant.

However, despite this more moderate growth than announced previously, provisions must clearly be taken so as to be able to enforce navigation regulations. The nature of shipping has diversified, with the usual research vessels and icebreakers now witnessing a growing number of cruise ships, pleasure boats, bulkers and tankers.

Accidents with tankers or cruise ship could have devastating environmental or human consequences. Caution should remain the rule and a good argument for the enforcement of non-discriminatory sets of regulations.

Acknowledgements

- Fonds québécois pour la société et la culture (FQRSC)
- Social Sciences and Humanities Research Council (SSHRC)
- Ministry of Defense of Canada
- Natural Resources Canada
- Transport of Canada

- Fishing and Oceans Canada
- Nordreg
- Canadian Embassy in the People's Republic of China (Beijing)
- Tourism Greenland
- Tourism Nunavut
- Fednav-Enfotec
- Shanghai Institute for International Studies
- Polar Research Institute of China
- the several shipping and insurance companies that cooperated with our research team

References

Alexeeva, Olga and Frédéric Lasserre, 2012. « Le Dragon des Neiges. Les stratégies de la Chine en Arctique » Perspectives chinoises/China Perspectives, 91(3), CEFC, Hongkong, p.61-68.

Alexeeva, O. and Lasserre, F., 2013, La Chine en Arctique. Stratégie raisonnée ou approche pragmatique?, *Études internationales*, v.44, no.1, 25-41.

Bartenstein, K. «Protection de l'Arctique maritime: la coopération régionale revisitée à travers les régimes antarctique et baltique», (2012) 17 *Annuaire du droit de la mer* 217-257.

Bourbonnais, P. and Lasserre, F., 2013, Winter Arctic shipping: with climate change, towards the development of year-round traffic?, *Marine Policy*, submitted.

Boyer, A.; Lasserre, F. et Têtu, P.-L., 2014, La pêche commerciale dans l'Arctique canadien : vers une exploitation durable et rentable ?, *iCIRRICQ, La Revue du Centre interuniversitaire de recherche sur les relations internationales du Canada et du Québec*, 1-18.

Genest, P. and Lasserre, F., 2013, Le discours du gouvernement canadien et la construction de la

- souveraineté en Arctique, Canadian Foreign Policy Journal, accepted, forthcoming 2014.
- Griffiths, F. Huebert, R.; Lackenbauer, P., 2011. Canada and the Changing Arctic. Sovereignty, Security and Stewardship. Waterloo, Wilfrid Laurier University Press, 340p.
- Ho, J., 2010. The implications of Arctic sea ice decline on shipping, Marine Policy 34; 3, p.713-715.
- Hong, Nong. 2012. "The melting Arctic and its impact on China's maritime transport". Research in transportation economics 35(1): 50-57.
- Huang, L., Lasserre, F. and Alexeeva, O., 2013, Is Arctic shipping at the heart of China's interest for the Arctic?, Proceedings of the international symposium The Arctic Passages and the Northern Strategic Collaboration; 184-195.
- Huang, L. Lasserre, F. and Alexeeva, O., 2013b. Arctic shipping and China's shipping firms: a special role for State corporations?, Actes du colloque international Le capitalisme d'État dans la nouvelle économie globale/ State Capitalism in the New Global Political Economy, 1-13.
- Jensen, O., 2008. « Arctic shipping guidelines: towards a legal regime for navigation safety and environmental protection? », Polar Record, 44(229).
- Lackenbauer, P. Whitney, 2011. Canada and Arctic Sovereignty and Security: Historical Perspectives. Calgary: Centre for Military and Strategic Studies/ University of Calgary Press.
- Lackenbauer, W. and James Manicom, 2013. "East Asia-Arctic Relations: boundary, Security and International Politics". Paper no.5, 23 p., Centre for International Governance Innovation (CIGI), Waterloo, Canada.
- Lalonde, S. 2013. "The Arctic Exception and the IMO's PSSA Mechanism : Assessing their Value as Sources of Protection for the Northwest Passage ». 28:3 International Journal of Marine and Coastal Law, 401-432.
- Lalonde, Suzanne et Frédéric Lasserre, 2013. « The Position of the United States on the Northwest Passage: Is the Fear of Creating a Precedent Warranted? », Ocean Development and International Law, 44(1), p.28-72.
- Lasserre, F., Le Roy, J. and Garon, R., 2013, Is there an arms race in the Arctic?, Journal of Military and Strategic Studies, v.14, no.3-4, 1-15.
- Lasserre, F. and Pelletier, S., 2011. « Polar super seaways? Maritime transport in the Arctic: an analysis of shipowners' intentions », Journal of Transport Geography, 19, 1465-1473.
- Lasserre, F. and Têtu, Pierre-Louis , 2013. « The cruise tourism industry in the Canadian Arctic: analysis of activities and perceptions of cruise ship operators », Polar Record, available on CJO2013. doi:10.1017/S0032247413000508, p.1-15.
- Lasserre, F. « Simulations of shipping along Arctic routes: comparison, analysis and economic perspectives ». Polar Record, available on CJO2014. doi:10.1017/S0032247413000958, janv. 2014, p.1-21.
- Laulajainen, R. 2009. The Arctic Sea Route. Int. J. Shipping and Transport Logistics, 1(1) 55-73.
- Liu, M. and Kronbak, J., 2010. The potential economic viability of using the Northern Sea Route (NSR) as an alternative route between Asia and Europe, Journal of Transport Geography 18, 434-444.
- Marchenko, N. 2013. Navigation in the Russian Arctic: Sea Ice Caused Difficulties and Accidents. In ASME 2013 32nd International Conference on Ocean, Offshore and Arctic Engineering. American Society of Mechanical Engineers.
- Pelletier, JF and Guy, E. 2012. Evaluation of maritime transportation activities in the Canadian Arctic. Cahiers Scientifiques du Transport, 61.
- Rodrigues, J. 2008. « The rapid decline of the sea ice in the Russian Arctic », Cold Regions Science & Technology, 54(2), p.124-142.

Schøyen, H. and Bråthen, S., 2011. The Northern Sea Route versus the Suez Canal: cases from bulk shipping, *Journal of Transport Geography* 19, 977-983.

Stewart, E.J., Dawson, J., Howell, S.E.L., Johnston, M., Pearce, T. & Lemelin, H., 2012. Local-level responses to sea ice change and cruise tourism in Arctic Canada's Northwest Passage. *Polar Geography*, (2012):1-21.

Stewart, E.J., Howell, S.E.L., Draper, D., Yackel, J & Tivy A., 2010. Cruise Tourism in Arctic Canada: Navigating a Warming Climate. In Hall, C. Michael & Saarinen, Jarkko 2010. *Tourism and Change in Polar Regions: Climate, Environment and Experience*. London & New York, Routledge.

Turmel, M.; Guy, E.; and Lasserre, F. 2013. Marine Carriers' Business Model and Development in the Canadian Arctic, *North American Competitiveness in Global Trade : The Role of Transportation*, Proceedings of the 43rd Annual Conference of the Canadian Transportation Research Forum, 243-257.

Wang, Yuqiang and Jianmin Shou. 2013. Economic analysis and navigation feasibility probe into Sino-Europe maritime transport route of Northeast navigation route, – *Marine Technology*, 2: 21-24.

Wergeland, T. 2013. Northeast, Northwest and Transpolar Passages in comparison. In: Willy Østreng (ed.). *Shipping in Arctic Waters. A Comparison of the Northeast, Northwest and Trans Polar Passages*, Berlin: Springer Verlag and Praxis: 299-352.

Wright, C. D., 2011. The Dragon Eyes the Top of the World: Arctic Policy Debate and Discussion in China. Naval War College, Center for Naval Warfare Studies, China Maritime Studies Institute: Newport, RI, 56 p.

Xu, Hua Yin, Z. Jia, D. Jin, F. and Ouyang, H. 2011. The potential seasonal alternative of Asia–Europe container service via Northern sea route under the Arctic sea ice retreat. *Maritime Policy & Management* 38(5): 541-560.

Zysk, K. 2010. Russia's Arctic Strategy, *Joint Force Quarterly* 57, Q2.

Zysk, K. 2012. Russia's Naval ambitions. Driving forces and Constraints, in Peter Dutton, Robert Ross, Øystein Tunsjø (eds.), *Twenty-First Century Seapower. Cooperation and conflict at sea*, London : Routledge.

Publications

(All ArcticNet refereed publications are available on the ASTIS website (<http://www.aina.ucalgary.ca/arcticnet/>).

Alexeeva, O. and Lasserre, F., 2013, La Chine en Arctique. Stratégie raisonnée ou approche pragmatique?, *Études internationales*, v.44, no.1, 25-41

Bartenstein, K., 2013, Protection de l'Arctique maritime : la coopération régionale revisitée à travers les régimes antarctique et baltique, *Annuaire du droit de la mer* 2012 v.17, 217-257

Bartenstein, K., 2013, The 'Arctic Region Council' revisited – Inspiring Future Development of the Arctic Council, Lalonde, S. and McDorman, T. (ed.), *The Arctic Ocean: International Law and Politics. Essays in Honour of Donat Pharand*,

Bartenstein, K., 2014, Article 211, Proelss, A. (ed.), *UNCLOS Commentary*,

Bourbonnais, P. and Lasserre, F., 2013, Winter Arctic shipping: with climate change, towards the development of year-round traffic?, *Marine Policy*,

Boyer, A., Lasserre, F., 2014, Quel cadre réglementaire pour la pêche dans l'océan Arctique ?, *iCIRRICQ, La Revue du Centre interuniversitaire de recherche sur les relations internationales du Canada et du Québec*, 1-43

Boyer, A., Lasserre, F. et Têtu, P.-L., 2014, La pêche commerciale dans l'Arctique canadien : vers une exploitation durable et rentable ?, *iCIRRICQ, La Revue du Centre interuniversitaire de recherche sur les relations internationales du Canada et du Québec*, 1-41

Comtois, C. and Slack, B., 2013, Measuring ocean transit time: Results, Report to Economic Analysis Directorate, Transport Canada, 111 p.

- Comtois, C. and Slack, B., 2013, Increasing competitiveness of port supply chain system: exporting dry bulk commodities from Canada, Proceedings of International Association of Maritime Economist Conference, 1-16
- Desbiens, C., 2013, Power from the North : territory, identity and the culture of hydroelectricity in Québec., Vancouver, 256 p.
- Desbiens, C., 2013, Dix idées pour le Nord : un manifeste pour la nordicité, Cahiers de Géographie du Québec,
- Desbiens, C., 2013, Ouvrir le Nord : réflexions sur le Plan Nord et l’imaginaire pionnier d’hier à aujourd’hui, in C. Lévesque, D. Salée and I. Radu (ed.), Les peuples autochtones et le Plan Nord : éléments pour un débat. Cahier DIALOG no. 2012-04, 23-31
- Desbiens, C. and Rivard, E., 2013, From passive to active dialogue ? Aboriginal lands, development and métissage in Québec, Canada, Cultural Geographies, doi: 10.1177/1474474013487485
- Genest, P. and Lasserre, F., 2013, Le discours du gouvernement canadien et la construction de la souveraineté en Arctique, Canadian Foreign Policy Journal,
- Guy, E. and Lasserre, F., 2013, Navigation commerciale dans l’Arctique canadien : nouvelles perspectives, obstacles et encadrement, C. Sellin and L. Gardelle (dir.), Réguler la mondialisation - les défis du nucléaire et du réchauffement climatique, 119-135
- Guy, E. and Lasserre, F., 2013, Commercial shipping in the Arctic: new perspectives, challenges and regulations, Grovers, V. (ed), Impact of Thining of Ice on Arctic,
- Huang, L. Lasserre, F. and Alexeeva, O., 2013, Arctic shipping and China’s shipping firms: a special role for State corporations?, Actes du colloque international Le capitalisme d’État dans la nouvelle économie globale/ State Capitalism in the New Global Political Economy, 1-13
- Huang, L., Lasserre, F. and Alexeeva, O., 2014, Is China’s interest for the Arctic driven by Arctic shipping potential?, Asian Geographer,
- Huang, L., Lasserre, F. and Alexeeva, O., 2013, Is Arctic shipping at the heart of China’s interest for the Arctic?, Proceedings of the international symposium The Arctic Passages and the Northern Strategic Collaboration, 184-195
- Lalonde, S., 2013, Marine Protected Areas in the Arctic, The Law of the Sea and Polar Regions : Interactions Between Global and Regional Regimes (ed. A.O. Elferink, E. Molenaar & D. Rothwell), 85-111
- Lalonde, S., 2013, The IMO’s PSSA Mechanism and the debate over the Northwest Passage, Polar Oceans Governance in an Era of Environmental Change (eds. T. Stephens and D. VanderZwaag),
- Lalonde, S., 2013, The Arctic Exception and the IMO’s PSSA Mechanism: Assessing their Value as Sources of Protection for the Northwest Passage, International Journal of Marine and Coastal Law, v.28, no.3, 401-432
- Lalonde, S., 2013, The Role of the Uti Possidetis Principle in the Resolution of Maritime Boundary Disputes, Sovereignty, Statehood and State Responsibility – Essays in Honour of James Crawford (eds. C. Chinkin & F. Baetens),
- Lalonde, S. and McDorman, T., 2013, Donat Pharand: The Arctic Scholar, The Arctic Ocean: International Law and Politics, Essays in Honour of Donat Pharand (eds. S. Lalonde and T. McDorman),
- Lasserre, F., 2013, Revendications canadiennes sur le passage du Nord-ouest : une rhétorique militaire excessive ?, Défense et Sécurité Internationales HS 29, 42-49
- Lasserre, F. and Alexeeva, O., 2013, La Chine en Arctique?, Diploweb, La revue géopolitique, 1-13
- Lasserre, F. and Alexeeva, O., 2013, Analysis of Maritime Transit Trends in the Arctic Passages,

- Lalonde, S. and McDorman, T. (ed), *The Arctic Ocean: International Law and Politics. Essays in Honour of Donat Pharand*,
- Lasserre, F. and Huang, L., 2013, *Is Arctic shipping at the heart of China's interest for the Arctic?*, *Bulletin of International Studies on the Polar Regions (Shanghai)*, v.2, no.4., 20-23
- Lasserre, F. and Plouffe, J., 2013, *Des multipolarités concurrentes dans l'Arctique : une possible refondation de la gouvernance régionale?*, E. Mottet and B. Courmont (dir.), *Repenser la multipolarité*, 203-222
- Lasserre, F. and Têtu, P.-L., 2013, *The cruise tourism industry in the Canadian Arctic: analysis of activities and perceptions of cruise ship operators*, *Polar Record*, doi:10.1017/S0032247413000508, 1-14
- Lasserre, F. Huang, L. and Alexeeva, O., 2013, *Science et politique arctiques en Chine. Éclairages de la série de séminaires sino-canadiens*, *Monde chinois, Nouvelle Asie*, no.34, 157-159
- Lasserre, Frédéric; Le Roy, J. and Garon, R., 2013, *Is there an arms race in the Arctic?*, *Journal of Military and Strategic Studies*, v.14, no.3-4, 1-15
- Olivier, D. et Comtois, C., 2013, *Mesurer les rendements des ports de vrac: l'expérience du Canada*, Y. Alix et R. Lacoste (dir) *Logistique et transport des vracs*, 449-478
- Pelletier, J.-F., Guy, E., 2013, *Supply and demand for the Eastern Canadian Arctic Sealift*, *Maritime Policy and Management*,
- Pelletier, S. and Lasserre, F., 2014, *Intérêt de la Chine pour l'Arctique: analyse de l'incident entourant le passage du brise-glace Xue Long en 1999 à Tuktoyaktuk*, *Territoires du Nord-Ouest, iCIRRICQ*, *La Revue du Centre interuniversitaire de recherche sur les relations internationales du Canada et du Québec*, 1-22
- Rodrigue, J.P., Comtois, C. and Slack, B., 2013, 3rd edition, *The geography of transport systems*, 416 p.
- Slack, B. and Comtois, C., 2013, *Measuring ocean transit times of container shipping: an empirical study of the TransPacific trade*, *Proceedings of International Association of Maritime Economist Conference*, 1-14
- Têtu, P.-L. Lasserre, F., 2013, *Expansion of Cruise Tourism in the Canadian Arctic: Analysis of potential and actual activities of cruise ship operators*, Lemelin, R.H., Maher, P.T., & Liggett, D. (dir.). *From Talk to Action: How Tourism is Changing the Polar Regions*, 78-92
- Turmel, M., Guy, E., and Lasserre, F., 2013, *Marine Carriers' Business Model and Development in the Canadian Arctic*, *North American Competitiveness in Global Trade : The Role of Transportation*, *Proceedings of the 43rd Annual Conference of the Canadian Transportation Research Forum*, 243-257
- Wang, C., P. Harrison and F. Lasserre, 2013, *China's presence in the Arctic region - an interview with Professor Peter Harrison and Professor Frédéric Lasserre*, *Bulletin of International Studies on the Polar Regions (Shanghai)*, v.2, no.3, 20-21