

# A EUROPEAN SHIPPING COMPANIES SURVEY ON ARCTIC SHIPPING EXPECTATION VS. REALITY

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## Summary

Operating a vessel in Arctic waters is complicated, costly and risky. Arctic shipping has gained growing attention since the early 2000s as a result of global warming. Although the duration, extent and nature of ice coverage are changing, the annual variability and a significant degree of uncertainty will remain. However, although the feasibility of increasing maritime traffic in the Arctic is tightly related to ice conditions, it is also coupled to governance, geopolitical factors, infrastructure development, prices of resources, and the interest of shipping companies. This paper describes the results of a study conducted from 2015 until 2016 on European shipping companies and their perceptions of Arctic shipping. The purpose of this survey was to take into account the operational point of view of shipping companies, and determine the interest for the Arctic market and whether the current trend was reflected the boom in the industry anticipated in the media.

**Keywords:** Arctic shipping, risk, European shipping companies, business opportunities, Northwest Passage, Northern Sea Route.

## Résumé

L'exploitation d'un navire dans les eaux arctiques est compliquée, coûteuse et risquée. La navigation dans l'Arctique a attiré de plus en plus l'attention depuis le début des années 2000 en raison du changement climatique. Bien que la durée, l'étendue et la nature de la couverture de glace changent, la variabilité annuelle et un degré important d'incertitude demeureront. Cependant, bien que la faisabilité d'augmenter le trafic maritime dans l'Arctique soit étroitement liée aux conditions des glaces, elle est également associée à la gouvernance, aux facteurs géopolitiques, au développement des infrastructures, aux prix des ressources et à l'intérêt des compagnies de navigation. Cet article décrit les résultats d'une étude menée de 2015 à 2016 sur les compagnies maritimes européennes et leur perception du transport maritime dans l'Arctique. Le but de cette enquête était de prendre en compte le point de vue opérationnel des compagnies de navigation, et d'évaluer leur intérêt pour le marché de l'Arctique.

**Mots-clés :** navigation arctique, risque, compagnies maritimes européennes, occasions d'affaires, Passage du Nord-ouest, Route maritime du Nord.

## 1. Introduction

Although operating a vessel in Arctic waters is complicated, costly and risky, Arctic shipping has been gaining growing attention over the past decade because of changes in ice conditions resulting from climate change (Vihma 2014, Pizzolato and others 2016, Melia and others 2016, Ford and others 2019, Schwanen 2019). In particular, several authors have underlined the potential interest of the opening of this shipping lane for European commercial development (Laulajainen 2008; Xu *et al.* 2011; Weber and Iulan Romanyshyn 2011; Young 2012; Wegge 2012; Moe 2014; Pélaudeix and Rodon 2013; Lasserre 2017). The media has been portraying the Arctic as the next routine transit route, but not everyone agrees. Several research papers have been critical of that view (e.g. Verny and Grigentin 2009; Somanathan *et al.* 2009; Mejlaender-Larsen 2009; Farré and others 2014; Lackenbauer and Lajeunesse 2014), in particular noting that there is a sharp discrepancy between cost models from the literature, enthusiast predictions in the media and low traffic levels; a discrepancy that is little tackled within the literature (Lasserre and Pelletier 2011; Lee and Kim 2015; Beveridge *et al.* 2016; Lasserre *et al.* 2016; Doyon *et al.* 2016; Ng *et al.* 2018).

Essentially, there are three options for sailing through the Arctic: the Northeast Passage (NEP), the Northwest Passage (NWP) and the Transpolar passage (TPP). Vessels do transit the NEP, a shipping route along the Norwegian and Russian Arctic coasts. Some segments of these routes are only free of ice for a limited time and require the assistance of icebreakers, which allows the traffic to extend by a number of weeks. The NWP is a group of routes going through the Canadian archipelago and North of Alaska. The Passage is mostly used by Canadian companies, cruise companies and marine tourism operators, pleasure craft operators and a limited number of international companies (Lasserre and others, 2016).

The main argument that shipping in the Arctic will increase is that climate change is rendering the waters ice-free. Although many areas are starting to be free of thick impenetrable sea ice, it does not mean that the waters have no ice whatsoever, nor that the environmental conditions for operations will improve. In fact, as thick multi-year ice floes break apart to yield freely floating ice, operations are becoming more dangerous, not less (Marr, 2001; Ostrend, 2013; McGwin, 2014; Lasserre and others, 2016). Growlers, for example, float just below the surface of the water, making them very difficult to identify (Bourbonnais and Lasserre 2015). Other models predict that extreme annual variability, the drift of multi-year ice south (Maurette 2010), storms, waves and icing conditions will remain as important issues (Molenaar 2009). We can also add to these models the operational points of view of shipping companies and experienced ice navigators that sail in the Arctic.

In Canada, the debate on the possible development of Arctic shipping in both media and academic arenas focus on a future increase in traffic through the NWP, mainly by foreign fleets that could threaten Canadian sovereignty over the Passage (Huebert 2001, 2011; Byers 2009; Wright 2011; Alexeeva and Lasserre 2012; Hong 2012). In these discussions, the focus is largely on growing traffic originating in Asia, particularly from China (Huang and others 2015; Beveridge and others 2016). European companies are often over-looked in discussions of a growing Arctic shipping industry and no paper specifically tackles the ongoing developments in the European shipping market. We chose to focus on this European market because a few European shipping companies have experience and knowledge about polar or sub-polar navigation through their long-standing operations in the Baltic and North Seas and their voyages to the Barents and Greenland Seas and along the Northern Sea Route and North-Eastern Passage (Roston 2008, Raspotnik and Rudloff 2012; Berzina 2014). Since a 2011 study conducted by Lasserre and Pelletier (2011), ice melt has continued and several authors have continued to hint that shrinking sea ice will provide favourable operational conditions and improved cost effectiveness for the industry to a point that will make Arctic shipping highly attractive. In 2016, we wanted to follow up with the 2011 survey to establish:

(1) if the strategies of European companies on the short-, mid- and long-terms have changed, and (2) if new patterns appear in terms of future intentions of ship operators and the evolution of the industry. Exploring European shipping companies' strategies is all the more relevant given that the literature often overlooks them, despite there being numerous European companies interested in expanding their activities in Arctic shipping.

The purpose of this paper is to explore the perceptions of European shipping companies for and against developing an Arctic shipping industry. The paper is divided as follows: we will first present the methods and the scope of the survey, then we will explore the economic drivers, the interest for destinational and transit traffic, and the costs and risks of shipping in the Arctic from an operator's point of view. We will then discuss the discrepancies between the perceptions of the ship owners and the perceptions that some researchers, journalists and politicians have on the opening of the arctic.

## **2. Methods**

### **2.1 Scope of the survey**

In order to compare how interests might have changed since Lasserre and Pelletier's 2011 survey that was mentioned previously, we followed their methodology. We made slight modifications to their questionnaire and added two questions: one about risk and the second regarding monitoring technologies (See Appendix 1). The analysis resulted in three papers, the first one focused on Asian companies (Beveridge and others, 2016) and the second one gave a global description of the international ship owner's intentions in the Arctic market (Lasserre and others, 2016). Here, we explore the perceptions of European shipping companies regarding the potential commercial opportunities of Arctic sea routes.

The companies interviewed are international companies and all have an English version of their website. The questionnaire were written in English, and sent in PDF format with no limitation in terms of the number of words that could be used in the responses. The answers did not present any language issues. Moreover, we attempted to reach some companies by translating the questionnaire in Russian and in Italian, for example, but we did not receive any additional responses with these efforts. We accompanied the questionnaire with a short cover letter, explaining: 1) the academic purpose of the survey, and 2) the definitions of destinational transport and transit shipping.

Our work followed five major steps: First, we checked the database compiled in 2011, and updated the numbers (TEUs, tonnage) and the statuses of the companies (bankrupt, sold, absorbed into another group). The original database contained 118 companies. Once the companies that went bankrupt or were sold were removed, 111 companies remained. Second, we updated a formal and structured questionnaire developed by Lasserre and Pelletier in 2011, mixing closed and open-ended questions in order to promote rich and detailed responses (Arksey and Knight 1999; Vaus 2014). The open-ended questions did not involve multiple prompts, as we did not want to orient the answers. We kept the original core of Lasserre and Pelletier's survey in order to obtain comparable results, but we also added two new questions about the types of risks encountered and knowledge about monitoring systems in the Arctic. The main reason for this additions is that, at the time of the survey, Dalhousie University was working on a project aimed at designing an operational concept for a new monitoring system for the Canadian Arctic, called PASSAGES (Protection and Advanced Surveillance System for the Arctic: Green, Efficient, Secure) and they needed to collect background information.

In June 2014 we sent the questionnaire via email to 111 European shipping companies, with questions focusing on corporate strategy. We targeted executives, mainly market executives. Even if our choice was to target the market executives in order to get an overview of the corporate strategy, some companies did not answer or transferred our questionnaire towards operational managers. In some cases we received two answers for a single company. In these instances, we compared the two answers and summarized the company's vision, whether the answer was from a market executive or from an operations manager.

In January 2015, we followed-up on the emails with phone interviews when the companies did not answer.

The data collected was analysed during the summer of 2015 and reported upon (Beveridge and others, 2016; Lasserre and others, 2016).

## 2.2 Our sample

Our database concerns only commercial shipping; we did not take into account fisheries nor the marine tourism industry. We targeted only companies and corporations that own or charter cargo ships, and for which they have a control over the routes the ships ply. Of the 111 European companies contacted, including global shippers, 83 answered the survey (see table 1; for a detailed list see Appendix 2). Twenty-two of these 83 are already active in the

Arctic; 56 are not. One company was not yet active in the Arctic, but was in the process of servicing the Arctic with operations commencing “soon”, according to their answer. Three companies used to service the Arctic but were no longer operating in the region, and finally one company completely stopped its shipping activities, which puts our sample size at 82 companies divided as follows (See Table 1).

**Table 1. The European companies that answered the survey, presented by sectors of activity**

|                     | Container | Ro-Ro | Dry Bulk | Tanker | Mixed | General cargo<br>Multipurpose<br>Special projects<br>Heavy lift | TOTAL |
|---------------------|-----------|-------|----------|--------|-------|---|-------|
| Number of companies | 19        | 1     | 20       | 20     | 5     | 13  | 82    |

To enter more into the detail, the 22 companies active in the Arctic are the traditional northern ones, with the exception of 3 companies that have their headquarters based in Greece and in Cyprus. The company that was not yet active in the Arctic is a Dutch company, that is as of March 2017, fully active in the NEP and the NWP. We could have divided our sample into the companies that are active and interested in navigating in the Arctic versus the companies that are not. However, because the answers were similar in style regardless of whether they were or were not interested in navigating in the Arctic, we judged it was better to focus on the responses as a whole.

### 2.3 The analysis

The analysis was conducted in three phases: (1) we created an Excel file in which we documented the answers of every company for each of the questions. (2) Then, we extracted the keywords for each answer given, and (3) finally, we systematically coded the results in Nvivo 11 Pro (QSR International, 2016) using a set of keywords and a simple binary code indicating whether or not the keyword was cited in the answer: zero (0) if it was not, one (1) if it was. Our goal here was to keep generalizations to a minimum; we wanted to show precisely what the shipping companies were indicating in their responses. In order to assess the reliability of our coding process, two members of the research team independently coded the database. In the final step, we compared the two sets of coding and the fidelity index reached 96%.

### 3. Economic drivers

#### 3.1 Reliability of Arctic sea routes and commercial viability

The aim of the first question was to understand, from an operational point of view, if there is a future for Arctic shipping and if there is, what are the main drivers in terms of the limitations and competitiveness for the ship owners. The presentation of the results is threefold. First, we give an overview of the results (See Fig. 1) limiting the visualization of the results to: 1) yes, there is a potential, 2) no there is no potential, and 3) there is a limited potential.

Then, the results were broken down in two categories, namely limitations or attractiveness. As shown in figure 1, in a sample of 74 responses, 39 companies (53%) see a commercial potential or stated that opportunities exist, even if those opportunities do not concern their company's operations. Twenty-five companies (34% of our sample) do not see any potential or clearly expressed a disinterest in Arctic shipping, especially because they consider that the polar routes have no role to play in the current maritime economy. In May 2016, Hugh Stephens from Calgary University published similar results. Although climate change seems to offer great perspectives, the reality is quite different mainly because of the unpredictability of this specific environment and the general decline in trade and cargo shipping (UNCTAD 2015; Stephens 2016). Ten companies (13%) foresee limited potential. Climate change in itself appears not to be a driver of developing Arctic shipping, but rather an enabler of business opportunities (Beveridge and others 2016).

#### COMMERCIAL VIABILITY OF AN ARCTIC MARKET

Share of respondents according to the level of potential estimated

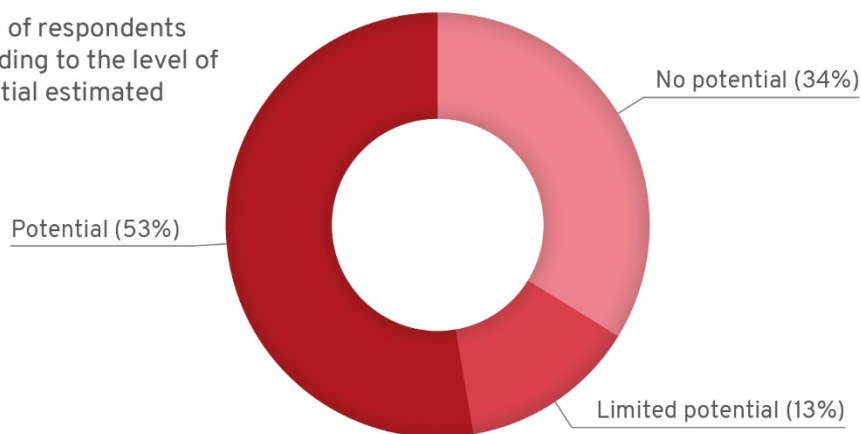


FIGURE 1 - The commercial viability of an Arctic market based on 74 European shipping companies answers.



Our set of keywords is extensive and comprehensive. In figure 2 below we derived keywords used by the shipping companies and ranked them by occurrences so as to describe the general views on the commercial potential of the Arctic market.

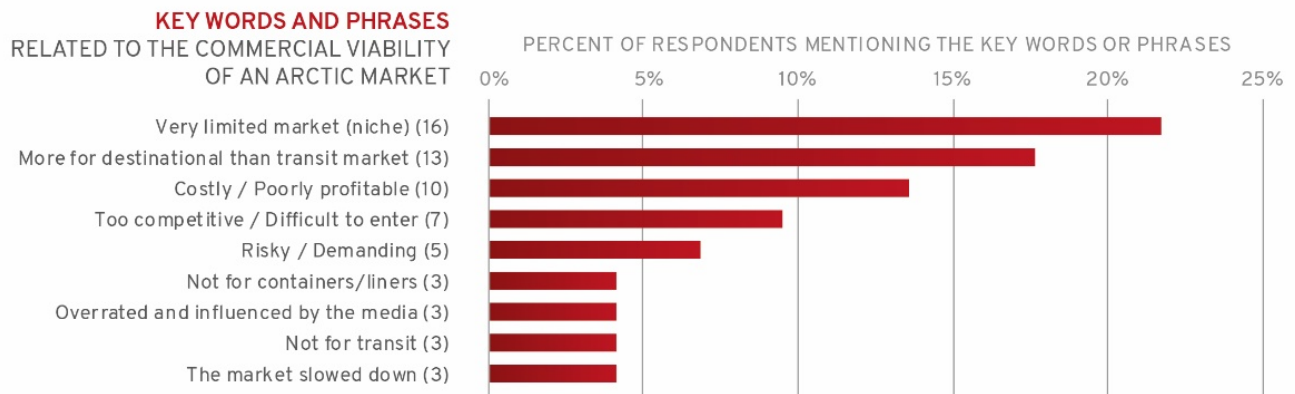


FIGURE 2 - Keywords extracted from the 74 responses received, ranked by occurrences in the answers.

Following this interpretation, we present the characteristics that make the Arctic market attractive (See Fig. 3), and those that are seen as the main limitations (See Fig. 4) as described by the shipping companies interviewed. The key drivers behind the attractiveness of an Arctic market are clearly environmental, economic and technological. These results are very similar to what Myllylä and colleagues determined during their workshops (Myllylä and others 2016). They also found that social issues, sustainable development and politics were factors affecting the prospects of business development in the Arctic.

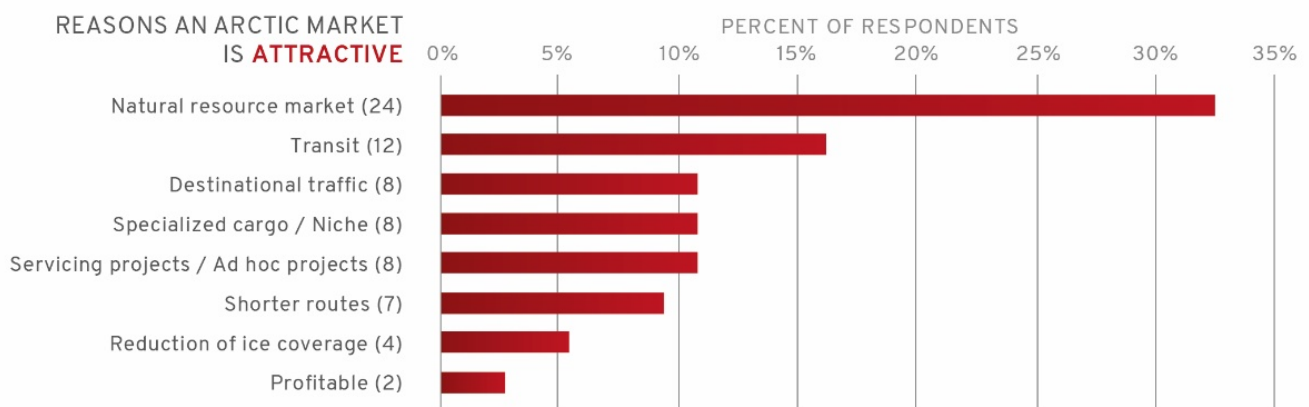
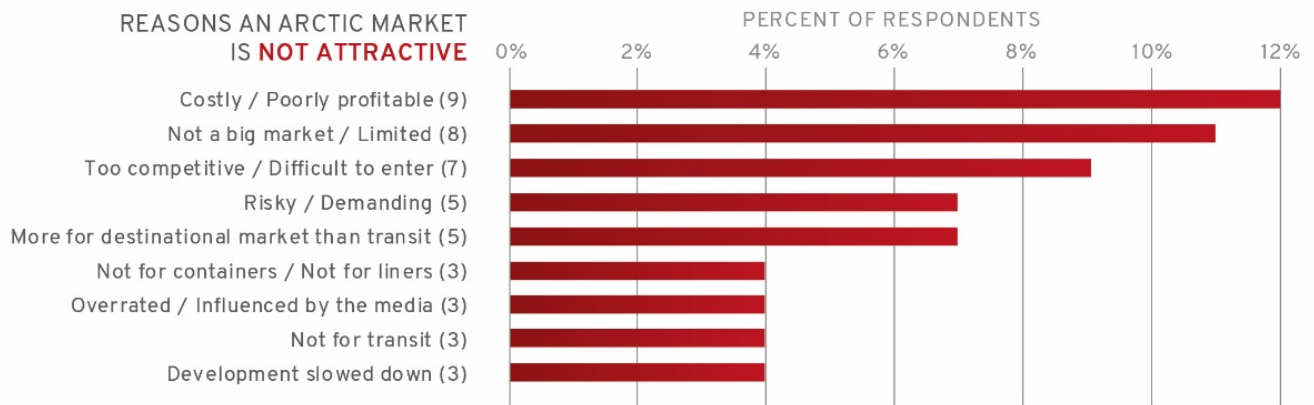


FIGURE 3 - Eight key drivers for competitiveness of the Arctic shipping according to European shipping companies.



**FIGURE 4 - The nine major limitations to enter the Arctic market as seen by the European companies.**

On 74 answers, the main limitation distinguishes itself as being costly and poorly profitable.

### 3.2 A niche market

Several shipping companies talk about a "niche market" regarding the Arctic, a concept that barely was present five years ago. The firms often used the term "small market". This may reflect the fact this is just another buzzword, or it may be a deeper reflection on strategic issues. One of the limitations of developing an Arctic market is perceived to be the fact that it is a niche market open only to a specific type of traffic, and largely only to those who have historical experience operating in the region (mentioned by 13 companies in survey responses). The companies recognize that the Arctic represents a growing market, but that it remains very small and competitive, targeted mostly by bulk and heavy sea lift. The liner companies do not see an economic value for their services, though they recognize that the Arctic market is interesting for natural resource transportation. Even if they are skeptical, three companies regularly reassess the potential of the Arctic market.

The fact that the Arctic is a niche market is also seen as an attractive characteristic for some shipping companies, especially for the transportation and exploitation of natural resources (32%). Eight companies (11%) see opportunities for specialized cargo transport. Bulk shipping is less sensitive to timing than liner shipping, and so can accommodate delays often associated with voyaging through ice and uncertain weather. Most of the bulk companies operating in the Canadian Arctic, for example, only sail when their customer asks them to do so, and if they are stuck at some point of the journey, it is not considered as a deviation of the original plan, but rather as a planned delay.

### 3.3 Destinalional, transit or ad hoc projects?

The answers here are twofold. First, a set of six companies see the Arctic market as an opportunity more for destinalional shipping rather than transit, or simply not for transit at all (three companies). The is a second set of 14 companies that see the opportunity for transit as attractive. The difference of answers here is probably related to the type of companies that answered and where they typically operate; the companies responding that Arctic transit shipping is attractive are operating in and thus likely referring to the NEP as opposed to the NWP (some used the NWP but it remains anecdotal).

#### *Trans-Arctic shipping*

In the media and sometime even academia, trans-Arctic shipping is mislabeled as 'transit'. Ships traveling between the Pacific and Atlantic via the Canadian Arctic Archipelago without stopping at any port to exchange cargo are conducting trans-Arctic shipping (Molenaar 2009). An example is the trip made by the *Nordic Orion* in September 2013, whereby the ship travelled from Vancouver, BC to Finland without making a single call to port in between. Reasons for an increase in trans-Arctic shipping are the potential time and cost savings associated with using the Northwest Passage rather than the traditional routes; the *Nordic Orion* saved Nordic Bulk Carriers approximately \$200,000 and arrived at its destination four days early. The unpredictability of the northern environment, as well as the complexity of the archipelago and the minimal bathymetric charting means that there are still high risks with traversing the Arctic waters, particularly when the markets behind cargo shipping rely on on-time deliveries (Ho 2010; Etienne and Pelot 2013; Chang and others 2015).

#### *Destinalional traffic*

Destinalional shipping take places in two major ways: ships sailing from port to port within the Arctic region; and ships sailing between an Arctic port and a port external to the region. In the Arctic, community re-supply and sealift represent a significant portion of the destinalional traffic.

#### *Sealift and Community Resupply*

Many of the coastal communities in the Canadian Arctic receive a single annual shipment of goods that lasts them the entire year; from food to fuel to building supplies (AMSA 2009; Etienne and Pelot 2013). The size of the Northern population is increasing (Emelyanova 2017), though, meaning there is a greater demand for goods, and this trend is expected to continue. Any construction operations, such as those of the Territorial Governments or of industry,

must also receive supplies via ship, as the majority of communities, including all the communities in Nunavut, are not linked to southern Canada by road. Thus, as northern development progresses, so too will the demand for deliveries. This parallel increase between community size and the number of projects will complement one another, as the stakeholders can share costs by loading cargos for both needs on a single ship.

*Opportunities in major resources projects* Sixteen percent see opportunities to seize in servicing new projects such as construction, heavy lift, etc. The Arctic trade between Kirkenes and Sabetta (Russia) is viewed as a strategic choice and offers new business opportunities for companies such as ESL Shipping Ltd. An increasing number of new projects does not necessarily equate to more traffic, though. Rosatomflot, for example, saw its traffic decrease in 2014 because the price of raw material decreased, even though it was servicing the Yamal LNG Project, which produces 17.6 million tonnes of LNG per year. The concepts of niche markets and ad hoc projects related to the promises brought by natural resources exploitation projects and the plans of building camp-mines, new platforms and deep-sea ports. During the last Arctic Shipping Forums (North America and International) held in 2014 and 2015, the future was not as clear nor as promising as what is presented in the media. Tactical Marine Solution (Canada) presented the mood in the Arctic as “sour and sad” (Loughnane 2015). Many projects are not economically viable and others are unlikely because they are too expensive. At the Arctic Shipping Forum in 2015, Dermot Loughnane summarized the situation: the projects that could be stopped have been, and projects far too advanced to be stopped, such as Goliat and Yamal are on. The cost of development is very high in the Arctic, and the infrastructure is too expensive to maintain and to improve, even in the NSR.

## **4. Navigating the Arctic remains challenging**

### **4.1 Costs**

One of the major variables are the costs associated with Arctic shipping. Sixty-two of the total 82 companies replied to this question (76%), which generated 15 key topics represented in figure 5 below. In order to avoid repetitions, we grouped some answers under only one topic.

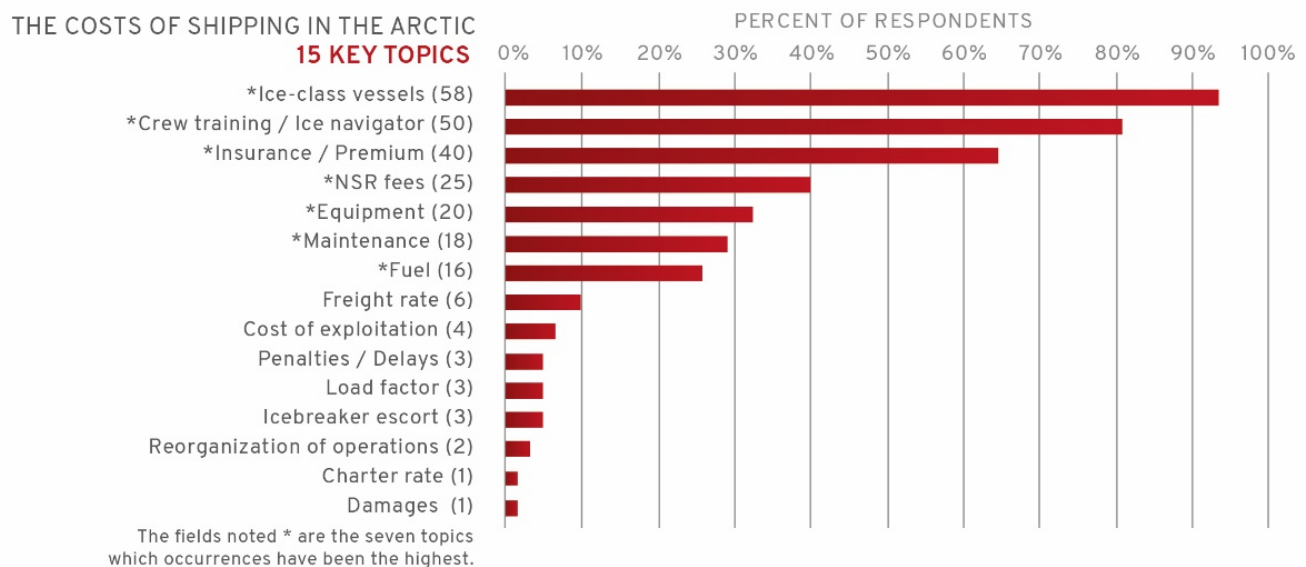


FIGURE 5 - The costs of Arctic shipping according to the European shipping companies' answers.

From those, seven topics can be highlighted (See the keywords with \* in Fig. 5): 1) the investment in ice-class vessels, 2) the importance of having a trained crew and ice navigator, 3) insurance and premiums, 4) NSR fees, 5) equipment, 6) maintenance, and 7) the consumption and type of fuel.

In terms of technological needs, the major costs are purchasing new material and finding use for polar class ships year-round and outside of the Arctic Region, which is difficult to achieve for now. Open waters are not a preferable situation for icebreakers since they do not have stabilizers and because the shape of the hull is not optimized for fuel efficiency.

Ice-class vessels are designed to withstand ice pressure, not to break ice; they are more seaworthy than icebreakers but nevertheless consume more fuel and have less cargo capacity because of their specific naval architecture. An ice-class vessel is not a good asset in a fleet if it is sailing only three months of the year. Such a big investment questions the profitability for many companies.

The expected benefit of Arctic routes for container ships and liners in general is associated with an anticipated reduced cost. In the Arctic, and especially the NWP, the lack of infrastructure, places of refuge, icebreakers, etc., all contribute to greater costs, which makes the Arctic and particularly the NWP rather unattractive for newcomers. Even for

natural resource export, respondents highlighted that pipelines would be faster and cheaper than sailing the NEP or the NWP.

#### 4.2 Assessing the operational challenges

The answers have been divided into three main categories: (1) feasibility of business, (2) availability of business, and (3) the Arctic environment. For 93% of our sample (54 companies answered this question), the Arctic environment is the most challenging area they have or will have to deal with. Under this category fall ice conditions, seasonality, weather, remoteness, among others. The answers are very detailed, which proves either a deep knowledge of the Arctic environment or an interest in eventually accessing the Arctic for shipping. These results are perfectly in line with the presentations made during the Arctic Shipping Forum held in 2015 in Helsinki about the NSR : waiting times for the icebreakers, for the customs and for discharging; impossibility of changing the crew; a very demanding climate; local operators trying to impose difficult administrative entry barriers; and necessity of having enough food supplies. It can be profitable but there are high risk factors in terms of environment and technology (Larsen and others 2016).

#### 4.3 Assessing the risks

Navigation in the Arctic is risky and very demanding. The goal of the fourth question was to give a detailed overview of what experienced and non-experienced ship owners identified as risks. The risks, listed by the companies concern clearly the risks to ships and not the risks from the ships. Very few companies described impacts that shipping may have such as incidents that will lead to an accident (grounding, accidental discharge). The impacts to shipping related to the delays that the harsh environmental conditions bring and the associated costs.

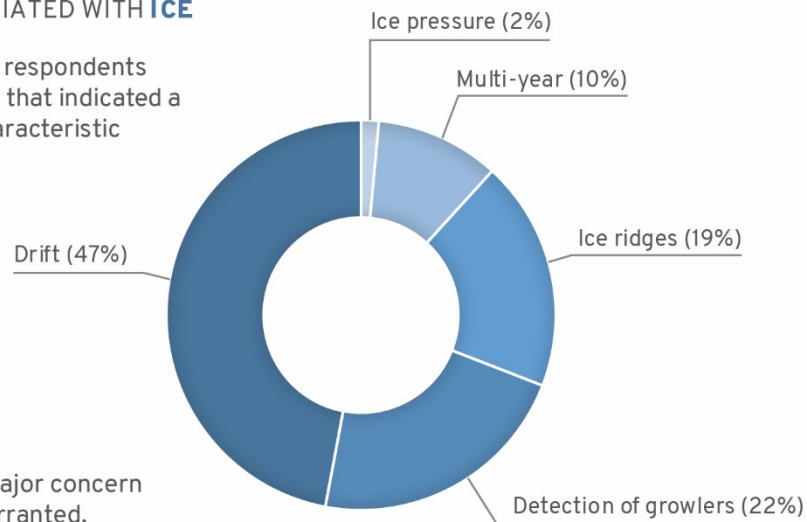
The answers to questions 1, 3 and 4 show that the uncertainty and the great variability is mostly due to the harsh environment and, after the costs, are the main limitation to entering the market. Costs and risks go hand in hand; in order to limit and mitigate the risks, ship owners need to invest in training their crew, hiring an ice navigator, and purchasing ice-class ships, special oil for the extreme weather, and special material and equipment. Shipping companies listed 27 risk topics, but for the sake of simplicity, we grouped some topics together.

The companies highlight two major factors: ice (93%) and weather (50%); we detailed these two categories in the figures below (See Figures 6 and 7). Regarding the ice, the major risk reported is drifting ice because of collision hazards, a concern still warranted as attested by

accidents in past years (see Figure 8) and by the increase of glacier melt leading to more iceberg calving. Regarding the weather, icing is seen as a major issue.

RISKS ASSOCIATED WITH **ICE**

The percent of respondents referencing ice that indicated a specific ice characteristic

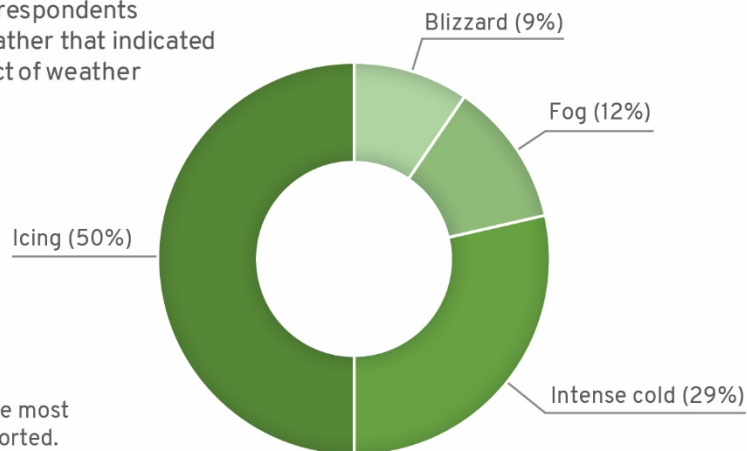


Ice drift is a major concern that still is warranted.

Figure 6 - The risks associated with ice, as seen by the European companies interviewed.

RISKS ASSOCIATED WITH **WEATHER**

The percent of respondents referencing weather that indicated a specific aspect of weather



Icing has been the most frequent risk reported.

Figure 7 - Risks associated with the weather, as reported by the European shipping companies.



Figure 8 - The effects of the *Reduta Ordona* collision with a growler in Hudson Strait on its way from Poland to Churchill, Manitoba, July 21, 1996. Quebec City, MIL Davie shipyard.

Source: courtesy Brian Hill and MIL Davie, in B. Hill (2016), *Iceberg Right Ahead: Historic photographic evidence may lend support to a counterintuitive strategy for ship captains seeking to survive iceberg collisions*. *Cutting Edge*, vol. 2, <http://cuttingedge.isgp.ubc.ca/journal/volume-2/2016/>.

Companies and agencies such as C-CORE, DRDC, and the Meteorological Finnish Institute and projects such as LookNorth are mapping icebergs and try to discern icebergs from vessels, and to detect ice ridges, ice packs, etc. When it comes to ice, the ship is not the risk; ice is the risk (Lasserre and others, 2016). In 2014 a geoscientist from TMAC Resources Inc., working on the Hope Bay gold project talked about an eight-week window for operations (construction of the camp-mine, then shipping). Their main issue was trying to mitigate the zones with highly dynamic ice. The waters can be open at 99%, but if the navigator tries to voyage through the 1% of ice, then “it will ruin the day”; so, open waters does not mean the ship can go “full steam ahead”. The Polar Code uses the terminology of the World Meteorological Organization and



defines open water as “a large area of freely navigable water in which sea ice is present in concentrations less than 1/10. No ice of land origin is present”.

What is also important to add for this part is that most of the shipping companies already operating in the Arctic have experience in assessing risks, because it is a mandatory process for planning a voyage and because underwriters will not let a ship navigate without having conducted a risk assessment. Companies are also working in collaboration with institutes that will provide the necessary training for the crew and specialized training for ice navigators. They also work with research institutes, meteorology and ice agencies that will provide them with risk assessment systems that indicate route changes/updates, etc. For example, Eimskip, a Finnish company, is working with Robin Berglund on a route optimization model (Guinness and others 2014).

Icing is a problem for Arctic shipping. In November 2015, during a seminar on risk management for voyages in ice, Captain Paul Cordeiro from NWP Marine explained how “ice” is not a sufficient category of risks because the incidents associated with ice are caused by very different things and produce very different consequences. The answers provided by the European companies are in this regard very interesting. Of course, as stated previously, ice is a keyword arising in 93% of our sample, but within this 93% are descriptions of the different types of issues the ice will bring.

#### 4.4 Monitoring and navigation services

The final questions of our survey concern the knowledge of the existing monitoring systems and the navigation services that could be enhanced or that those companies deem essential for safety. These answers complement questions 3 and 4 about operational challenges and risks. The goal of these final two questions is to provide more details about the safety of navigation, and to assess the knowledge of companies concerning the systems in place on how they could improve in order to facilitate navigation. Monitoring is important and challenging due to the remoteness of the region, which is highly cited as an operational challenge in question 3, and the financial limitations. Installing monitoring systems in the Arctic is a challenge due to the weather and remoteness, and the challenges these pose to maintaining any infrastructure.

There is a noticeable difference in terms of infrastructure between the NEP and the NWP. One company spoke about the Northern Canada Vessel Traffic Services also known as NORDREG, which has the role of protecting the arctic marine environment, ensuring an efficient navigation and enhancing the safety at sea. The same company compared the situation

between Canada and Russia and defined the situation as “fine”. Based on the results we received from North American companies (Lasserre and others 2016), the system in place works well for the current level of traffic. One company also noted that in the event that traffic in the NWP increased, the navigation services and infrastructure available would subsequently increase in response. The North American system will need to improve if traffic increases to levels similar to the NSR. Some projects are looking at designing and/or enhancing monitoring systems that could increase the range of traffic monitoring and the ship detection capabilities along the NWP (e.g., PASSAGES, Polar Epsilon, BlueHawk, OceanWay, Narwhal from ION Concept Systems to a certain extent or SmartOcean).

Surveillance of maritime activities is necessary as well as the enhancement /improvement of the emergency preparedness and management in case of a crisis or a disaster. A good assumption to keep in mind before going to the Arctic is that, in terms of emergency response, because it is so remote, if something happens, the vessels are on their own (Ford and Clark 2019). Along the 5,600 km of the NSR there are five Maritime Rescue Sub-Centres (MRSC) with radar coverage and one Maritime Rescue Coordination Centre (MRCC). This is the major difference with the NWP in case of an emergency: there is one Marine Communications and Traffic Services Centre in Iqaluit, but all assets are based in southern Canada. Some Canadian Coast Guard vessels will spend the open-water season in the Arctic, but the vastness of the area could still mean that rescue is days away.

The results show that only few companies have knowledge of the existing monitoring systems. However, only 18 companies (22% of our sample) answered the question, most of which simply took the opportunity to complain about the administration of the NSR, rather than describing the existing systems. Four companies judged that the NSR Administration made many efforts but that they could be more efficient and professional. Only eight companies currently navigating in the NSR commented that the existing systems, understood as buoys, icebreakers escorts and communications, are sufficient and efficient. However, a Danish company explained that even an efficient monitoring system could not make up for the challenges associated with navigating in ice, which was described in questions 3 and 4. A major issue that was tackled by some respondents is the quality of data, meaning quality of charts, especially for the NWP. Though this one is relative as the Canadian Hydrographic Service (CHS) is in the process of improving the maps for the Corridors Initiative and because the ship owners only use the Corridors they know. The lack of aids to navigation is in the process of being enhanced thanks to the satellite-based AIS (Automatic Identification System), improving the coverage and monitoring, and complementing the existing systems like NORDREG.

One service that was anticipated but was not mentioned in the survey responses is the lack of ports and places of refuge along the NWP. It comes surely from the fact that the European companies active in the Arctic are active in the NEP and not so much in the Canadian Arctic.

## 5. Conclusions and perspectives

In 2011 Lasserre and Pelletier not only showed that there was a lack of literature and research taking into account the operational point of view of shipping companies, but they also reported, based only on shipping companies answers, that the interest for the Arctic market was limited and that the current trend was far away from the planned boom. Although our sample size was almost double that of the 2011 survey, the results were very similar. In 2011, 21.28% of the companies declared being already active in the Arctic and/or being interested, and 68.09% stated clearly not being interested in the Arctic. The remaining 10% comprise uncertain companies. In 2015, of a sample of 83 companies, 22.89% of the companies indicated their intention of increasing their activities, while 62.65% answered that they are not planning on entering the Arctic market, either because it does not enter into their business plan or their strategies, or because they are simply not interested.

The main argument that shipping in the Arctic will increase is that climate change is rendering the waters ice-free. Although many areas are starting to be free of thick impenetrable sea ice, it does not mean that the waters have no ice whatsoever, nor that the environmental conditions will be better. In fact, as thick multi-year ice floes break apart to yield freely floating ice, operations are becoming more dangerous (Marr 2001; Yokishawa and other 2006; Østreng 2013; Gignac 2014). Other models predict that extreme annual variability, waves and icing conditions will remain an issue (Molenaar 2009; Pizzolato and others 2016). To these models and the operational points of view from shipping companies used to sailing in the Arctic and from experienced ice navigators, it is also important to add that climate change would have no effects on the bathymetry nor the geography of the passages.

For example, some straits of the NWP are narrow and shallow, and whether or not they are ice-free will not affect the ability for large vessels to take these routes. Nevertheless, some maintain that melting sea-ice will have an effect on emerging business opportunities in the Arctic, in particular with respect to the need for logistics and support (Myllylä and others 2016), which seems to be validated by the growing interest from companies specialized in heavy lift and servicing ad hoc projects. It is also good to be reminded that the Northwest Passage has no port facilities or places of refuge (Bourbonnais 2010; Bourbonnais and Lasserre 2015; Sinclair 2015; Giguère and others 2015). The long-debated construction of a

deep-water port in Iqaluit, finally to be finalized in 2020, or the revitalization of the port in Nanisivik, and the small crafts harbours in Pond Inlet built in 2019 may facilitate the increase of traffic, but it will mainly support local shipping companies and the communities they service. The Northern Sea Route has infrastructures and aids to navigation, mostly icebreaker escorts that the Canadians simply cannot offer at this time.

Another commonly used argument to try to advocate that Arctic shipping will increase is the mentioning of theoretical shorter distances associated with taking the NWP or NEP compared to the Panama or Suez Canals. These shorter distances mean lower fuel costs and lower overall expenses associated with a voyage that takes less time. Although this may be true in some cases, i.e. if the vessel is not trapped in the ice or if the vessel navigates to a certain speed, the overall cost of Arctic operations remains extremely high, including the need to purchase or build ice-class ships (Ebinger and Zambetakis 2009). Furthermore, given that operations remain restricted seasonally and uncertainties in conditions from year-to-year and even over the duration of a voyage remain high, any benefits derived from using shorter Arctic routes in terms of distance voyaged do not justify the high costs for every company.

There is a clear discrepancy between the perceptions of the ship owners and the perceptions of some researchers, journalists and politicians on the opening of the Arctic. Myllylä and others saw in their workshops based on prospective experts, that the increasing commodity prices of natural resources, bio-economy and biotechnologies, and the effect of climate change are the key drivers behind the development of Arctic shipping routes. This seems to be far from ship owners considerations. Opportunities and possibilities of investments remain opened, but the attractiveness of the Arctic will improve from sustainable development, the development of strong governance, and investments in infrastructure and SAR capabilities (Faré and others 2014).

These conclusions seem warranted by the evolution of Arctic shipping since 2017: a fast expansion of destination shipping sustained by natural resources exploitation for the NSR; a moderately growing destination traffic along the NWP sustained by natural resources and community resupply; while transit traffic remains low along the NSR and next to nil across the NWP (Lasserre 2019; Lasserre 2018).

**Table 2. Number of transits through Arctic routes**

|     | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| NSR | 2    | 3    | 5    | 13   | 41   | 46   | 71   | 31   | 18   | 19   | 27   | 27   | 31   |
| NWP | 9    | 13   | 17   | 20   | 21   | 31   | 22   | 17   | 27   | 23   | 33   | 5    | 25   |

Sources : Nordreg, Iqaluit; CHNL, Kirkenes, <https://arctic-lio.com/>.  
 Partial data for 2019, until Oct. 15 for the NSR ; until Dec. 5 for the NWP.

**Table 3. Types of transiting vessel, Northwest Passage**

| Type of vessel | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2016 | 2018 | 2019* |
|----------------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Icebreaker     | 2    | 2    | 1    | 2    | 2    | 2    | 2    | 2    | 4    | 3    | 2    | 1     |
| Cruise         | 2    | 3    | 2    | 3    | 4    | 2    | 2    | 4    | 2    | 3    |      | 5     |
| Pleasure craft |      | 2    | 7    | 10   | 12   | 13   | 22   | 14   | 10   | 15   | 2    | 13    |
| Tug            | 1    |      |      | 2    | 1    |      | 2    |      |      |      | 1    | 1     |
| Commercial     |      |      | 1    |      |      | 1    | 1    | 1    | 1    | 1    |      | 5     |
| Research       | 1    |      | 1    |      |      | 1    | 1    | 1    |      |      |      |       |
| Total transit  | 6    | 7    | 12   | 17   | 19   | 18   | 30   | 22   | 17   | 23   | 5    | 25    |

Source : Nordreg, Iqaluit.  
 \* Data up to Dec. 5, 2019.

**Table 4. Types of transiting vessel, Northern Sea Route.**

| Type of vessel    | 2007 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019* |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Icebreaker        |      |      |      | 2    | 3    | 2    | 2    | 1    | 2    |      | 1    |       |
| Government vessel |      |      |      | 1    | 0    | 1    | 1    | 3    | 1    |      |      |       |
| Cruise            |      |      | 1    | 1    |      | 1    | 3    | 1    | 1    |      |      |       |
| Tug, service ship | 1    |      | 4    | 4    | 5    | 1    | 1    | 4    | 4    | 1    | 2    |       |
| Commercial cargo  | 1    | 5    | 6    | 31   | 38   | 64   | 24   | 15   | 11   | 24   | 23   |       |
| Research          |      |      | 2    | 2    |      | 2    |      |      |      |      |      |       |
| Fishing           |      |      |      |      |      |      |      |      |      | 2    | 1    |       |
| Total transits    | 2    | 5    | 13   | 41   | 46   | 71   | 31   | 18   | 19   | 27   | 27   | 31    |

According to statistics from the Northern Sea Route Administration. Transits understood as between Bering and Kara Straits.

\* On Oct. 15, 2019.

Source : CHNL, Transit Statistics, <https://arctic-lio.com/category/statistics/>; Lasserre, F. (2019). La navigation arctique en 2019 : l'épreuve de la réalité. L'Année Arctique 2019. Revue annuelle, 17-25. Observatoire de la Politique et de la Sécurité de l'Arctique (OPSA), Montréal.

As a follow up of our survey, more oriented to applied research, it would seem to be potentially very interesting to find other ways of dividing the sample, and enter into the details of the companies experiences, corporate strategies and knowledge of Arctic shipping and to compare them. However, based on our results, the style of answers we received and the conversations over the phone or in person that we had, the companies do not share their strategies that easily, and decided to talk more about developing their operations or going to the Arctic when they have a contract, or that specific operations have been successful.

The Arctic is and will remain for the near future, a complex and costly choice of shipping routes. Despite all the media hype, the situation is still pretty much the same: shipping companies clearly balance risks and benefits and right now, the outcome is that many are not interested.

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## **7. Note**

[1] Even if our choice was to target the market executives in order to get an overview of the corporate strategy, some companies did not answer or transferred our questionnaire towards operational managers. It happened that for a same company we received two answers, we compared them and we saw the same vision, whether the answer was from a market executive or from an operations manager.

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## Appendix 1

Questionnaire used for the survey.

Q1. What do you think is the commercial potential of Arctic shipping?

Q2. What are the costs associated with Arctic shipping? (e.g. ice-class ship; equipment; training; specific maintenance; possible penalties for delays...).

Q3. What are the operational challenges associated with Arctic shipping? (e.g. seasonal route change; operation of a ship in ice; delays; respect of just-in-time; drifting and unpredictable ice patterns).

Q4. What are the risks associated with Arctic shipping? (e.g. icing (from sea spray); extreme cold; blizzards; growlers; ice ridges; multi-year ice; accidents and spills; damage to cargo (intense cold...)).

Q5. Does your company offer services (regular or occasional) in the Arctic?

Q6. If yes, do you intend to increase the level of your activity? Why? For what kind of service (transit, destination...).

Q7. If not, do you intend to enter the Arctic shipping market and develop activities in the area? Why? For what kind of service (destination, transit...)?

Q8. Do you know about current and planned monitoring systems in the North? How do you think monitoring services could be improved in the Arctic?

Q9. What are the navigation services you think are essential in the Arctic?