MARINE CARRIERS' BUSINESS MODEL AND DEVELOPMENT IN THE CANADIAN ARCTIC

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Introduction

Canadian Arctic waters are the subject of several scientific and governmental projects. In this regard, climate change impacts on its icy waters are profusely studied as the expected melting of the sea ice leads to believe in a significant maritime traffic increase. Although researchers are interested in the increased activities of commercial vessels transiting in the Northwest Passage as well as those related to the export of natural resources to southern markets, few study current activities in community resupplying. However, this variable explains most of today's flow of goods in the Canadian Arctic (Pelletier and Guy, 2012). Moreover, this market is specifically responsible for the significant increase in maritime traffic of goods observed in recent years.

Sealift is considered as an essential service for local communities in Nunavut and Nunavik because the air mode, which is the alternative, is a lot more expensive. Thus, voluminous and non-perishable goods such as snowmobiles, construction materials and cans are shipped during the ice-free season lasting from July through October.

NEAS and Desgagnés Transarctik (DTI) are the two marine carriers currently involved in Nunavut and Nunavik dry cargo resupplying. They both began operating in the Arctic more than 40 years ago. Respectively, owners of four (NEAS) and six deep draft vessels (DTI), they are based in the Montreal area.

In Nunavut and Nunavik, NEAS and DTI are facing severe conditions such as sea ice, winds, extreme weather and improper marine charts (Paquin, 2012). 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, operations are halted at low tide.

Proposed Port Developments

To find a solution to this issue and improve the northern supply chain, it is proposed to provide local communities with 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 (Figure 1). The second one, construction of deep-water ports (DWP), speaks for itself. Thus, as this study is shipper oriented, the question is "what would be best for them?" low cost infrastructure in every community or major infrastructure built at high cost in selected communities?

The methodology for this study is derived from an approach developed in an overall assessment of shipping policy in Canada (Guy and Lapointe, 2010, 2011). The approach postulates that decisions in the public sphere are not taken as the result of a rational evaluation of problems and means leading to an optimal solution. Rather policies are the product of an historical accumulation of compromises reflecting the relative power of multiple stakeholders. Therefore it is necessary to study the variability of objectives sought by all stakeholders as well as the diversity of measures in order to highlight complementing and conflicting interests. This knowledge can help break eventual deadlocks and ultimately produce better policies. In this study, we differentiated both objectives and measures

for the two port development models in the region (e.g. light infrastructures or deepwater). Table 1 presents stakeholders considered. The last section of our analysis is intended to assess the impacts of two models on the activities of dry cargo marine carriers.

Figure 1. Light infrastructure in Nunavik (Source: DTI)

Table 1. Stakeholders studied by sector

Stakeholders	Nunavik	Nunavut
LEVELS OF GOVERNMENT	Kativik Reg. Gov. Makivik Corporation Gov. of Quebec Gov. of Canada	Gov. of Nunavut Gov. of Canada
MARINE CARRIERS	NEAS Taqramut transport (DTI)	NEAS NSSI (DTI)

Information acquisition in this study was carried out with written sources, mainly reports from public agencies or consultants. This was coupled with semi-structured interviews with relevant stakeholders.

Inventory of Stakeholders' Objectives

Several targets have been set to justify the implementation of LI or DWP. While some of them are supply oriented, others are not. In the former case, three sub-objectives have been used: supply workers' safety, damage prevention to goods and efficiency in unloading goods.

Supply workers' safety and damage prevention to goods are not used as main arguments. Few damages let alone accidents happen nowadays thanks to measures taken by carriers. Stakeholders discussing safety and damage prevention ask for adequate marshalling areas and widespread use of containers rather than marine infrastructure. Marine carriers bemoan that residents, especially children, can walk on the beach around barges and tractors in motion. They argue that fenced staging areas, among others, would secure operations. Thus, previous solutions can be used in combination with both models. It is possible to conclude that the easiest and least costly solution will be preferred by policy makers.

Increasing the efficiency in unloading goods while reducing tidal constraints is the argument related to resupplying which is shared by the greatest number of policy makers throughout Nunavik and Nunavut. Among others, they are attracted to opportunities of cost savings that could arise from marine infrastructure. To this end, the construction of a DWP would be even more beneficial. However, the implementation of DWP isn't suited when the low volumes, the short ice-free season, the action of ice and permafrost, and the high tidal range in certain areas are considered.

In the latter case, even more objectives have been evaluated. To facilitate their assessment, stakeholders' objectives will be presented depending upon the specific region examined.

Regional assessment: objectives may vary

In Nunavik, analysis of goals unrelated to supply show that LI has been put in place to ensure sea access, to enable economic development of local communities and to ensure the safety of users relying on the sea for their livelihood. Among these objectives, safety is primary. Moreover, Kativik Regional Government (KRG) and Makivik Corporation wanted infrastructure that could benefit all 14 communities equally. Low cost LI in every community was therefore the appropriate solution. Marine infrastructure needs enabling an acceptable level of development in communities have long been recognised. As far back as 1975, local communities have been negotiating to include this component in the James Bay and Northern Quebec Agreement.

According to the Government of Nunavut (GN), and the Department of Fisheries and Oceans of Canada (DFO), in Nunavut, the LI model aims at benefiting local communities with their significant fisheries potential. The historical port infrastructure and fishing boat shortfalls have long prevented locals from taking full advantage of allocated quotas. Since then, the situation has changed, but the lack of marine infrastructure still limits efficient fish landing for further processing in Nunavut. Enabling economic development through commercial fisheries is thus considered a prominent objective among local representatives. DFO-GN's committee moreover wants facilities that can satisfy several requirements such as subsistence fishing, tourism, and search and rescue. As for the Government of Canada's (GC) LI objectives in Nunavut, it seeks first and foremost to enable the economic development of local communities. Actually, it is one of its Northern Strategy's four pillars.

In Nunavik, in contrast, supporting local and regional economies is a target set to justify the implementation of a DWP. The last Nord-du-Québec transport strategy jointly set up by Transport Quebec (TQ), KRG and Makivik Corporation mentioned it. This objective will be met through a better access to the territory with the development of air, road, rail and maritime networks. Specifically, a DWP would enable jobs in the mining sector. Without marine infrastructure, it will

be difficult to develop this industry as no other suited form of transportation links it to southern markets.

In Nunavut, GN's view over DWP implementation is similar to the one discussed above. As for the GC, objectives unrelated to supply are to assert Canadian sovereignty over Northwest Passage waters through a military presence and to enable the economic development of the territory.

To sum up, local users' safety in Nunavik and development of commercial fisheries in Nunavut are the main objectives to build LI. Although significant in Nunavik, objectives related to supply seem less relevant to policy makers in Nunavut. It is thereby reasonable to assume that Nunavik first conceived LI as the most suited model to facilitate resupplying while ensuring users' safety. Objectives related to supply will be met more appropriately by a DWP according to GN's discourse. DWP's 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. All things considered, it seems that there are fewer LI- and DWP-related objectives in Nunavik; they need infrastructure of lesser extent. Marine infrastructures are more easily implemented under these conditions. The more objectives, the less any infrastructure built will be suited to different uses.

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.

Implemented and Requested Measures

Between 1999 and 2010, Nunavik's marine infrastructure program resulted in the establishment of 14 safe and handling efficient LI installations as intended. There is thus consistency between policy makers' objectives and measures. In Nunavut, while many communities have very basic infrastructure, the sum of these measures tends to show that DWPs might be built in certain communities before LI is. Pangnirtung is the only community in which LI has been erected. However, this project doesn't seem to be part of a larger wave of construction, meaning that priority will be given to certain communities in favour of others.

Moreover, the capital costs of Pangnirtung's infrastructure are 7 times higher than the costs of any infrastructure in Nunavik. Despite the fact that inflation increased costs, that Nunavut's costs are higher than the ones in Nunavik, and that intended uses in Nunavut require more resources, Nunavut's LI is undoubtedly more capital oriented than Nunavik's. Under these conditions, is it possible to quickly set up quite a few LI installations in Nunavut? Would it be better to downscale LI projects? It is not likely to happen since policy makers want to develop commercial fisheries, thus ensuring that large LI will first be built.

As for DWP, they are still at the project stage. After a first DWP feasibility study in 1980, the GN started lobbying a few years ago in 2005 to get at least one of these in Iqaluit. Concerning the GC, it began funding studies aimed at assessing needs as well as expected benefits of each project. In Nunavik, projects are at an early stage. Even though locations (Kuujjuaq, Kuujjuarapik) were identified, policy makers are still at the stage of preliminary studies.

Most of the studies conducted in Nunavik and Nunavut showed that LI implementation is desirable. Studies concerning DWPs showed that, even though benefits for local communities are great, they are not sufficient to outweigh costs. Thus, local communities (beneficiaries) have set up more measures to ensure DWP construction than federal and provincial governments (donors).

Analyses tend to show that the Government of Quebec (GQ)'s involvement in Nunavik's projects is greater than GC's with Nunavut. Thus, concrete actions are undertaken in Nunavik. Local communities and GQ's measures are more similar as well. In Nunavut, even though the GN and DFO collaborated to produce a draft project of LI, GN and GC's objectives and measures are different. The result is that, of most projects put forward by the GN, very few have been implemented so far. GN's projects are placed in the hands of the GC due to a lack of capital. Their development is dependent on GC's needs and will. In order to accelerate the process, the idea of developing joint ventures with mining companies (e.g Bathurst Inlet Port and Road Project) is going a long way. However, uncertainties surrounding this industry reduce opportunities.

As for marine carriers, the sum of measures tends to show their interest for LI rather than for DWP. Thereupon, NEAS' speech is crystal clear: LI is the short term solution. DTI adds that while DWPs would be marginally better to them, improvements were observed following the implementation of the marine infrastructure program in Nunavik.

Impacts on Marine Carriers

Light infrastructure
To gain a larger market share, shippers make their services available to every community in Nunavut and Nunavik. Setting up infrastructure in each of them rather than in only one is thus more beneficial.

Moreover, LI improves operations through reduced tidal effects while enabling carriers to keep using the same business model. Their ships and their equipment are suited to that type of work.

DWP used in hub and spoke network
Implementation of one or more DWP would inevitably trigger changes for marine carriers. Some argue that the very organisation of resupplying could be modified. Actually, a hub and spoke (HS) network could be developed instead of the one now used (multi-porting). According to these stakeholders, this network would be

more beneficial than the current one and could enable economies of scale for marine carriers. It, however, involves large investments. Therefore, to be worthwhile, profits made have to be significant.

First of all, the setting up of a feeder service within an HS network means carriers will have to purchase new smaller vessels and sell some of the deep-draft vessels recently bought. Canadian Arctic communities, aside from Nunavik, do not generally have berths to accommodate feeders. Under this scenario, they will still have to carry tugs and barges on board limiting available space for goods. DWP construction within an HS network therefore calls for the implementation of LI in other communities.

Marine carriers' fleet modifications entail significant changes related to strategic decisions to be made. For instance, winter use of feeder ships is an issue not yet solved. Since current ships are small compared to others used in the different world markets, chartering even smaller ships elsewhere seems particularly challenging. Laying off these feeder ships could solve winter use issues. However, even if savings are generated, costs aren't null.

In addition, port transit costs will be higher under an HS network. As goods are handled twice in hub ports instead of once, higher port and handling costs are involved. The world's main liner companies, to better control and reduce high port transit costs as well as to ensure productivity, take control of cargo handling operations in visited terminals. However, it is unlikely in Nunavut and Nunavik considering the multi-user purpose of ports to be built as well as the small number of berths planned in studies.

At first, marine carriers were compelled to call at designated ports to access targeted territories, but now they see ports compete with each other to attract them. Among others, port authorities continuously adapt their infrastructure to follow shippers' needs and adjust fees to attract them. It ends up being an advantage for carriers who do not have to cover these costs. In the end, in most cases, calling or not calling at one port or another is a decision the marine carrier makes. In the Arctic, projects take for granted that if infrastructure is built,

carriers are systematically going to use it, a debatable assumption. It thus means that carriers rather than ports will have to cope with modifications lessening the benefits of this model.

The world's busiest hubs share common macrogeographic features. They are either located within a major import/export market or in between main liner routes. None of these is characteristic of the Canadian Arctic. It is thus unlikely that an Arctic DWP would handle a large amount of goods.

To sum up, it is possible to conclude that under current conditions, an HS network is not suited. Costs will presumably be higher than benefits gained. Consumers would then register higher transport costs. Reducing the price of goods, which is the goal currently being sought, wouldn't be reached.

DWP used under the current network

Within the framework of the current network, multi-porting, DWP construction in a community would increase carriers' operating efficiency, but only in that specific community. If built in one of the most in-demand communities, benefits will be greater. However, as presented above, DWP construction doesn't mean marine carriers can get rid of their tugs and barges as they will still be useful to unload goods in other communities. Since they have to visit these other communities, this construction seems minimally beneficial to marine carriers.

On top of that, DWP implementation means marine carriers will have to cope with other users. Then, even though time savings are possible, port, wharfage, and maybe handling dues will likely be charged to fund construction and maintenance. At last, construction of a DWP in a populated community could trigger the introduction of new players in the market interested in resupplying that single community. That profitable market share could thus be lost by current carriers in favor of new carriers.

Public-Private Partnerships: Opportunities for Carriers

To reduce construction and maintenance costs, and maximize benefits, several stakeholders suggest the development of DWP jointly with mining companies.

Past and present examples show that infrastructure sharing is useful for local communities only if it is linked to it as in the case of the Nanisivik mine site. The DWP, owned by the GC, was connected to the Nunavut community of Arctic Bay by a 32 km road. However, in this case, the DWP was only minimally beneficial for carriers, because they were still making a stopover in that community as it is located alongside the sea. When the DWP is not linked to a community, as in the case of Deception Bay's private port in Nunavik owned by Xstrata Nickel – Raglan Mine, it is only useful as a hub where stored goods are further redistributed. The reasoning presented above, however, showed that such an HS system is not suited. Current infrastructure is nonetheless private and only small quantities, for local communities, are carried by bulk ships to Deception Bay where they are later transported by locals, not marine carriers, to the nearby communities of Salluit and Kangiqsujuaq.

All things considered, DWP benefits are minimal for current marine carriers. It is therefore reasonable to think that they have no interest in promoting such infrastructure.

Carriers' priorities, besides LI, are rather focussed on other limiting factors such as marine charts, navigation aids, anchors and marshalling areas.

Conclusion

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 low as well.
- The DWP development model is considered in most cases as a means to facilitate economic development on a large scale. 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 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.
- 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.

Figures 2 and 3 sum up stakeholders' objectives and measures. They also underline the level of receptivity that seems to exist between them. To be qualified as receptive to the needs of another depending on him, an actor has to be interested in its issues, study them and

suggest suitable solutions. When one or more of these three aspects aren't fulfilled, the stakeholder is qualified as partly receptive or not receptive at all.

In Nunavik, the GQ, through TQ, seems receptive to carriers' needs as well as to those of KRG and Makivik Corporation. Measures put forward by TQ have so far satisfied the main objectives of these stakeholders. As for the KRG and Makivik Corporation, they are receptive to marine carriers' needs. They joined together with TQ to put in place the marine infrastructure program. Finally, the GC is virtually absent in Nunavik. It is thus not receptive to Nunavik stakeholders' needs. In Nunavut, the GC seems gradually more and more receptive to GN's needs as its interest in northern development progresses. It is however slightly interested in marine carriers' needs. As for the GN, even though it is trying to improve carriers' conditions of resupplying, it suggests solutions partly suited to targeted issues.

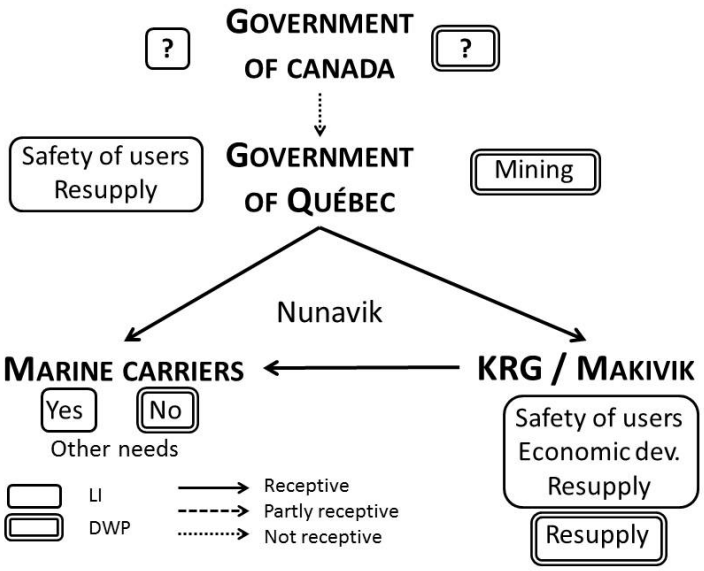

Figure 2. Interactions between stakeholders in Nunavik

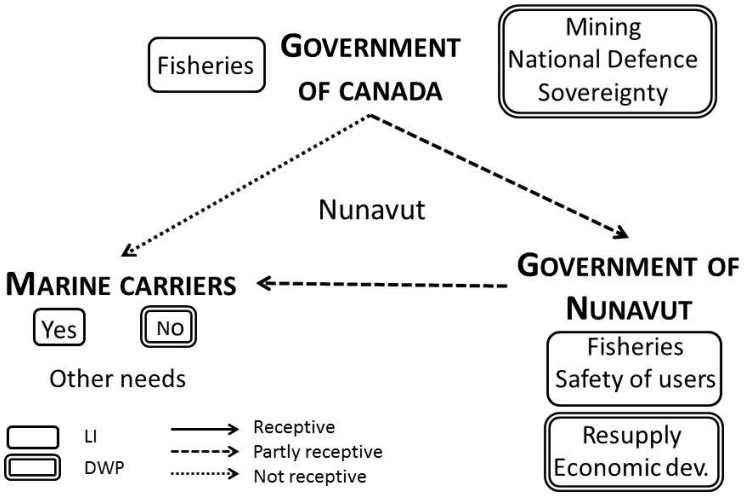

Figure 3. Interactions between stakeholders in Nunavut

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