Seaway Under-Utilization: Are Regulations to Blame?

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Executive Summary

This report considers the extent to which regulatory constraints contribute to current Great Lakes-St. Lawrence Seaway traffic levels that are low by historical standards. Another important question is whether this same regulatory environment hampers the development of Seaway marine in entirely new markets of higher value goods. In the sense that regulations tend to dampen economic activity, they are viewed in this analysis as a cost of doing business. By the same token, there are many non-regulatory components which are also costs of doing business. Key regulations are evaluated one at a time and also a series of cost and quality of service variables are considered across the key surface modes of the region: marine, rail and trucking. In making a determination, the main question is whether the regulatory aspects outweigh the non-regulatory variables or vice versa.

Key Regulatory Factors

With the removal of the 25% Canadian duty on foreign built ships in 2010, the most pressing issue for regulatory reform appears to be the U.S. Harbor Maintenance Fee. This legislation had been crafted, it seems, with almost an explicit assumption that the Seaway is for the movement of bulk goods. Under this legislation, a large administrative burden is attached to more complex movements that might involve multiple higher value cargoes. As such, it mitigates heavily against new types of marine cargo services.

In terms of cabotage/coasting trade legislation, the Jones Act appears to be quite entrenched largely for reasons of U.S. national security. Flexibility on the Canadian side with respect to similar counterpart regulations is therefore made difficult. The overall protectionist environment that prevails separates U.S. and Canadian domestic movements and also causes separation between domestic and international shipping. The fact that only 3% of American imports and exports are moved by American ships is a telling point. Domestic Seaway profits are taxed in Canada as they would be for any corporation, which seems fine on the surface, but is out of step with practices in many successful marine jurisdictions that have adopted a tonnage tax on marine fleets. Overall, Canada has appeared more open to the prospect of marine liberalization over the years than the U.S. and until there is movement on the U.S. side, Canada's options on these major regulatory issues are somewhat limited.

An important aspect of safety on the Seaway is ensuring that the waterway is navigated without incident. Accordingly, pilotage regulations are implemented to ensure that a person intimately familiar with local navigation channels is the one who controls the vessel. Although cheaper than in other jurisdictions, Seaway pilotage is a very significant cost component and can mean the difference between profit and loss for new entrepreneurial Seaway services. Under the Great Lakes Pilotage Authority, experienced captains are permitted to operate without pilots but not in the Montreal-Quebec section under the Laurentian Pilotage Authority. Recent stakeholder meetings have revealed ship-owners in particular are pushing for maximum flexibility whether that relates to exemption possibilities, who the services can be purchased from or the geographic areas defined as compulsory.

Actual environmental regulations in place have not been a major factor in influencing Seaway usage. On the other hand, threats of new, and sometimes extreme, regulations have the effect of chilling the Seaway investment climate. The recent New York State ballast water standards saga offers a good example. It would be a very positive development for the Seaway if unilateral actions by stakeholder governments of all types could be minimized or eliminated.

One interesting regulatory question for the federal and provincial governments is the question of marine as a preferred mode on the basis that it is perceived as environmentally friendly. In the European Union, marine has been given this special status in an effort to divert tonne-km from road to water and Marco Polo programs have been created to do just that. One significant difference between Europe and the Seaway region is that rail freight does not play a prominent role in the former region. At present, a policy of modal neutrality prevails in the Seaway region.

Key Non-regulatory Factors

Comparison of the three modes across key cost and quality of service variables reveals some interesting patterns for the Seaway region. Across the vast majority of variables that are of importance to modern day supply chains such as: logistics and inventory costs, timeliness and range of locations served, trucking ranks as a superior mode. The weaknesses of trucking relate to two variables in particular: high line-haul costs and high driver costs along with driver supply issues. Trucking in the region is arguably as complementary to the marine and rail modes as it is competitive on the basis that the latter two modes are quite dependent on trucking to reach the end points of freight movements.

Some of the more interesting comparisons are between rail and marine. The main variable where marine trumps the other modes is on its superior line-haul economics. Seaway marine is very hard to match in terms of moving large quantities of bulk goods over long distances. The trouble is that line-haul costs are just part of the equation. The development of fleets of self-unloading vessels by the main shipping firms in the region is a reflection of this fact. The self-unloader gives up some line-haul advantages in exchange for greater flexibility and timeliness in delivering its cargo.

Rail is quite simply better tied into the main logistics functions and hubs of the region. One of the foremost goods movement clusters in the region is located in the north and west of the Greater Toronto Area and is quite isolated from marine. Meanwhile, rail has extensive intermodal, transloading, and train assembly facilities in the heart of this cluster. In addition, rail has a trans-continental reach both in the east-west and north-south directions with the Greater Toronto Area being an important hub in this regard. On other important variables such as logistics costs, crew costs and handling costs, rail also has the upper hand for many types of goods. Of the three main rail businesses, which are intermodal, carload and unit trains, it can be argued that rail offers its stiffest challenge for marine in the containerized cargo of the intermodal segment.

One other area of advantage for rail is year round operation which is a very important consideration for modern day supply chains. Year round operation offers rail a solid negotiating position in that better rates can be offered to those customers who might otherwise consider using marine in the non-winter months. While marginal increases in the length of the Seaway season are taking place, they are

insufficient to change the perceptions of shippers about the problem of the winter closure. The winter closure is very inconvenient, but it also appears to be very necessary. The locks in the system require extensive maintenance while build ups of ice create complications in carrying out lock transits.

If there is one change to the Seaway which would open up a new range of shipping possibilities, it is probably undertaking the massive required investments to convert the system to a year round operation. Perhaps this would involve new technologies and the twinning of all locks so that one in each pair of locks could be closed each winter. Meanwhile, in some sectors of the economy, inventories are razor thin and just-in-time shipments predominate. For industrial sectors dependent on Seaway marine, inventories are much larger and the winter closure is often handled by stockpiling towards the end of summer. This one point highlights the key difference between lower value bulk commodities and high value goods which cannot be allowed to linger in a warehouse any longer than necessary.

One final but important non-regulatory aspect is exogenous forces. The functioning of the three surface modes within the Seaway region appears to be in a fairly stable equilibrium. For marine to make some significant headway in terms of moving more goods of higher value, some significant exogenous change would likely be required. This change could come in the form of an increase in goods movement traffic so large that the rail and trucking modes would become too congested to handle it. In recent years though, congestion has moderated if anything. Changes in trade patterns have certainly influenced Seaway marine volumes in recent decades and further changes are certain to come. The reduced role of the Canadian Wheat Board could provide a boost while pipeline development along the Quebec-Windsor Corridor could hurt Seaway volumes.

Overall

The overall conclusion of this research is that regulatory obstacles have not been the main determinant of reduced Seaway tonnages since the 1970's and nor do they promise to be the primary constraint that holds the Seaway back in the future. In terms of non-regulatory factors, changes on a global scale have affected the sourcing of Seaway commodities and the stiff competition offered by trucking and especially rail in the region offers a great deal of explanatory power. The high quality service offered by the other modes offers a serious challenge to the prospects of entirely new marine services in the region.

To say that the regulatory environment has not been the main determinant of marine volumes does not mean that there are not some glaring problems. There are clearly some significant regulatory issues that currently reside more so on the U.S. side of the border and which reduce the possibility for new types of Seaway marine services. The Harbor Maintenance Fee clearly lessens the potential for new services involving more complex shipments of higher value goods. A relaxation of U.S. regulations on cabotage might lead to a similar thaw on the Canadian side and a more liberalized environment for entrepreneurs to pursue successful new businesses. Above all, Seaway stakeholders collectively need to find a way to avoid any major, unilateral regulatory actions by the various government entities in the region, which potentially can impact the entire system. Recent experience illustrates the harmful effects of such actions on the Seaway investment environment.

Introduction and Background

1.1 Objectives and Scope

The purpose of this report is to examine the under-utilization of the marine mode on the Great Lakes-St. Lawrence Seaway (GLSLS) and consider to what extent the regulatory environment is responsible. Of course under-utilization can be measured relative to Seaway capacity or in terms of what is economically efficient. In the case of the former, there is no doubt that the Seaway is under-utilized but in the case of the latter there is room for debate. For the purposes of this report, we will assume under-utilization based on the fact that the major Seaway locks at the Welland Canal and below are operating at approximately 50% of their capacity (Marinova Consulting et al., 2009).

While there is little doubt that the trucking and especially the rail modes are attractive modal alternatives to marine in many contexts, there is also the possibility that there are some serious regulatory impediments which hamper marine competitiveness along the Seaway corridor. This report will examine these potential regulatory impediments in detail and will also consider the possibility that unfavourable perceptions of the marine mode play a role in shaping modal choices in the region.

In this report, the Great Lakes – St. Lawrence Seaway will be intermittently referred to as “the Seaway” or the GLSLS. This research has an emphasis on the lower Seaway (St. Lawrence River, Lake Ontario,

Lake Erie and associated locks) as opposed to the upper Seaway (Lake Superior, Lake Michigan, Lake Huron and the "Soo" locks). There is a particular interest in movements of goods along the Quebec-Ontario corridor which is very well served by the road and rail modes. The question is: how well can the marine mode compete along this important goods movement corridor?

Whatever the outcome of this analysis, it cannot be denied that the GLSLS is very important. The Seaway services 15 major international ports and 50 regional ports in both Canada and the U.S., generates almost $2 Billion in tax revenue for the national, provincial/state, and local levels of government on both sides of the border (Transport Canada et al., 2007) and supports substantial amounts of economic activity.

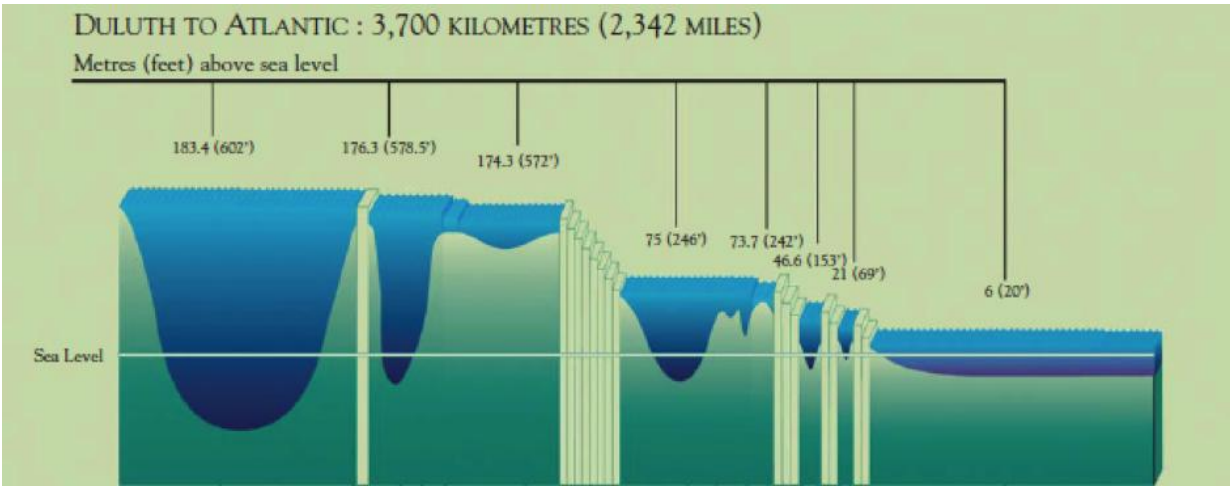
The outline of the report is as follows. The remainder of this introductory chapter will detail salient background information relating to the Seaway and events which have brought it to where it is today. In addition, there will be a brief synopsis of important recent research reports on the Seaway which have considered aspects such as market potential and regulatory impediments. Chapter 2 will serve as a detailed review of the regulatory environment in which the Seaway operates. A comparison between the Seaway regulatory environment in the North American context with that of the European Union is also made. Chapter 3 seeks to define a more detailed picture of all the variables (cost, service and exogenous) which influence shippers' choice of mode in this region. In addition, the value proposition of the marine mode is compared against the rail and road modes. Having provided an overview and discussion of the regulatory environment and considered the variables that affect the choice of mode, the concluding Chapter 4 of this report summarizes the findings and offers viewpoints on the degree to which the regulatory environment has had and is having an impact on the Seaway marine mode relative to other factors.

1.2 Development of the Seaway

The Great Lakes-St. Lawrence waterway is the largest system of fresh water rivers and lakes on Earth. Located at the core of North America's industrial heartland, the GLSLS basin accounts for 55% of North America's manufacturing and service industries and is home to 33 million people or 10% of the U.S. population and over 25% of Canada's total population as well as a number of the continent's largest urban centres (Great Lakes Information Network, 2011).

Originally, complex and large native societies developed in the region which traded and competed with each other over great distances made possible by the canoe and the vast water borne transportation network. By 1670, the French built the first of a chain of forts to protect the colonial fur trade and by 1727 permanent European settlements were being established. Waterways proved important in establishing colonial control over Central North America and the Great Lakes-St. Lawrence system in particular proved an effective means to extend power socially and economically as it connected vast amounts of North American territory with one marine highway.

Figure 1-1: Elevation Profile of the Great Lakes – St. Lawrence System



Source: Transport Canada et al., 2007

Shortly after European colonial powers began settling the area, efforts were made to enhance the Seaway by bypassing rapids, installing locks, and deepening channels. The Lachine Canal and the first Welland Canal opened in 1829. The rise of rail reduced the relative importance of the waterway but nevertheless, for the following 130 years, incremental progress was made until the 1959 opening of the GLSLS. The GLSLS allowed commercial and recreational vessels to navigate from ocean to central prairie and continental heartland of North America over 3,700 km of marine highway.

Figure 1.1 provides a cross-section of the Seaway and illustrates the approximately 180 metre drop that must be negotiated in travelling from Lake Superior to the St. Lawrence River. Figure 1.2 provides more detail on the locks that compose the key infrastructure components of the Seaway and indicates which nation operates each lock. The lower set of seven locks, closer to Montreal, run over 300km and are all the same dimensions. Five of the seven are managed by Canada. The Welland Canal is a series of eight Canadian locks running over 42km and traversing the Niagara Escarpment. In Figure 1.2, the main ports on the system are also detailed.

The GLSLS was constructed based on an assumed traffic pattern consisting of downbound prairie grain from Great Lakes ports, and upbound iron ore moving from the Lower St. Lawrence (LSL) in Quebec to steel mills in Canada and the U.S. For the first twenty-five years of operation, this was a very successful formula and tonnages moved in ever greater quantities. In 1958, five million tons of grain and iron ore moved on the Montreal-Lake Ontario section of the Seaway. By 1980, tonnages for both commodities were in the order of 25 million tonnes (McCalla, 1994).

In the 1980s, traffic declined on the Seaway dramatically because of changes in international markets. In the 1970s and 1980s European nations underwent an agricultural productivity revolution which boosted domestic yields and reduced the need for foreign grain. Meanwhile, demand for foreign grain in the Soviet Union tumbled. Also, there was a shift in demand for North American grain from Europe to Asian markets. By the 1990s, ports in British Columbia were handling 70% of Canadian grain exports and the

Mississippi River and West Coast ports in America were handling 98% of U.S. grain exports, leaving only 2% for the GLSLS (McCalla, 1994).

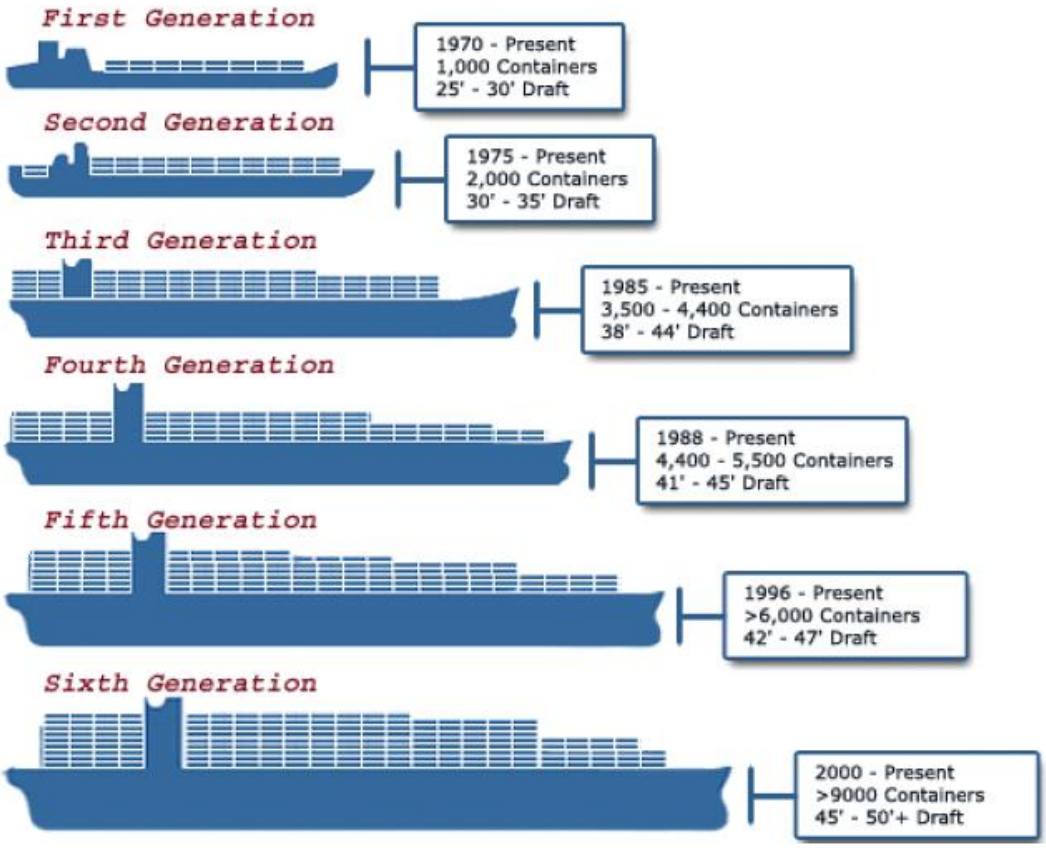
Figure 1-2: The Great Lakes - St. Lawrence Seaway System (GLSLS)

Source: Transport Canada et al., 2007

Changing international dynamics also explained declines in the movement of iron ore for steel. In particular, there was far more international production of steel than had previously been the case. East Asia rose as a manufacturing giant both of finished products and steel which re-oriented the economies of Canada and the U.S. towards the Pacific Ocean and containerized cargo. Cities in the GLSLS restructured towards the rise of the service economy and from primary production towards manufactured goods that were less steel-oriented. Not only was there reduced demand for iron ore and steel, but also for the coal used to power traditional manufacturing industries.

The first ISO standard containers were handled starting in the mid-1960s and a number of shippers such as Fednav, Hamburg American, Poseidon Lines and Hapag Lloyd invested in ships to move containers along the Seaway. Container terminals were developed at Montreal and Halifax and acted as hub ports for the smaller ports on the GLSLS. However, by 1970, a number of these companies had withdrawn from these investments, opting instead to stop the marine portion of the journey at Montreal or Quebec City and continue upbound using rail. Since that time, container shipping on the Seaway has been sporadic, with shipping companies offering the service for a few seasons then cancelling service due to lackluster demand (Marinova Consulting Ltd., 2005).

Figure 1-3: Evolution of Vessel Size in International Container Shipping



Source: Transportation Economics and Management Systems Inc. and RAND Corportation, 2007

An additional factor has been the size of ocean-going vessels, with maritime container ships evolving rapidly after 1970 to accommodate ever larger flows of freight and capitalize on economies of scale offered by containerization (Figure 1.3). By 1975, the Seaway was physically unable to handle modern container ships which required at least 10 metres draft for a 2,000 TEU (twenty foot equivalent unit) vessel. With a maximum draft of 8.1 metres, the Seaway quickly became obsolete from the standpoint of international container shipping. The 1,000 TEU vessel that could navigate the Seaway safely could not compete with the 2,000 TEU vessels that could go as far as Montreal and Halifax. Internationally, container ships as large as 15,000 TEU have now been built.

As well as draft issues, the locks of the GLSLS can accommodate vessels only up to a certain size. The Welland Canal allows for a maximum vessel length of 225.5 metres and a beam (width) of 23.8 metres. Seven other locks (five in Quebec and two in New York State) were built well after the Welland Canal and to these same specifications. Any location upstream of Montreal is accessible only by vessels which meet these size requirements. With the Seaway being constructed as it has, the Seaway fleet has developed as a fleet of specialized long and thin vessels (Marinova Consulting et al., 2009). One interesting historical note is that the Seaway locks were built smaller than they could have been partly

due to political pressure from east coast ports and rail interests who were concerned about the competitive impact of the Seaway (Stewart, 2005).

1.3 Key Commodities and Patterns

To a large extent the "Seaway" trade and the "Great Lakes" trade are really two different trades (Stewart, 2005; Marinova Consulting et al., 2009). Seaway trade is dominated by Canadian flagged and foreign flagged vessels and is Europe and North Africa oriented along with domestic business. The Great Lakes trade is associated with the movement of dry bulk commodities such as iron ore, coal, stone and grain and approaches about 200 million short tons per year. A much larger proportion of these movements are by U.S. vessels which are actually much larger and unable to fit through the Welland Canal and Montreal-Lake Ontario section of the Seaway. These vessels are optimized for the "Soo locks" which link the upper Great Lakes. The smaller Canadian Ports in the Upper Great Lakes could not support such large vessels (Marinova Consulting et al., 2009). Some of the main movements in the Great Lakes trade are iron ore to steel mills on Lakes Michigan and Erie and Eastern U.S. coal to steel mills and generating stations. There is some U.S. flag movement of grain eastward to Buffalo.

In recent years, the average tonnages transported through the Welland Canal and the Montreal – Lake Ontario sections of the seaway have been in the order of 30-35 million tonnes (Transport Canada et al., 2007) and 2011 was approximately 37 million tonnes. The 2008 financial crisis reduced total marine tonnages by about 15% in 2009. In 2010, tonnages rebounded to the five year average (Pung, 2011b). While the latest setback was severe, the GLSLS has coped with cyclical ups and downs throughout its history.

Regardless of cyclical realities, the GLSLS has always serviced certain key sectors that depend heavily on waterborne transportation. Iron and steel, energy production, and agricultural exports (especially grain) all rely on low cost bulk transportation that the marine mode can offer. It is useful to examine these individual commodities and sectors that depend on the GLSLS and the factors that influence the traffic volume for each. For other cargos (e.g. stone, cement, salt, chemicals and petroleum) traffic volumes are determined by consumption patterns which are driven primarily by local demand.

Grain

Grain moves eastward from the prairies by rail to Thunder Bay on the Canadian side and Duluth on the American side, and then is loaded onto downbound vessels at these ports. It is shipped on the Seaway for domestic consumption or is transshipped to ocean going vessels for export to overseas markets. In 2010, a total of 16 million tonnes of grain was shipped through the Seaway locks (The St. Lawrence Seaway Management Corporation and Saint Lawrence Seaway Development Corporation, 2010). American grain shipments via the GLSLS to Western Europe have been declining in tonnage for the last 25 years. One role of the Seaway is to supply an alternative route to the congested Mississippi River.

Movement of grain on the Seaway depends on how competitive marine is with alternative modes. With respect to rail, technological and legislative developments have made shipping grain directly from the prairies to transshipment terminals in Montreal and Quebec City more cost effective in some cases.

Rationalization of rail in Western Canada (i.e. closure of branch lines and regional elevators in favour of large inland terminals) has assisted also (Transport Canada et al., 2007). Currently, there is speculation that the changes taking place to the Canadian Wheat Board may have positive volume aspects in grains for the Seaway.

Iron Ore and Steel

Movements of iron ore represent the greatest tonnage transported on the Seaway. In 2010, over fifty million tons of iron ore was transported on the GLSLS, which accounted for 45% of the total tonnage transported. American iron ore is shipped from Marquette, Michigan via Duluth, Minnesota and Superior, Wisconsin and passes through the Soo Locks on special one-thousand foot vessels that operate upstream of the Welland Canal exclusively due to the Canal's size limitations. Canadian iron ore is shipped from mines in Labrador via Sept-Iles and Port Cartier, Quebec upbound to Hamilton, Cleveland and Toledo with the rest bound across the Atlantic Ocean to Germany and the United Kingdom (Transport Canada et al., 2007).

Due to the restructuring of the economies of North America, the number of companies making steel has shrunk, though those that remain are financially stronger and more productive (Marinova Consulting et al., 2009). The automotive industry in the region benefits from low transportation costs derived from purchasing steel which can be transported on the Seaway. Globally, increasing demand and prices for North American steel is increasingly driven by rapidly developing nations, especially China. Steel producers of the GLSLS are now able to produce lightweight steel using less coal. On the one hand these developments reduce coal traffic, but they increase movements of iron ore and steel on the Seaway (Marinova Consulting et al., 2009).

Coal

The shipment of coal on the Seaway can be analyzed based on the two industries that rely heavily on the energy derived from it. Major steel producers in the U.S. and Canada use metallurgical coal and coke. More important, however, is the fact that coal is destined for use in the power generation industry. The coal that is used to power homes and businesses in the GLSLS basin accounts for 94% of the total coal tonnage transported on the Seaway (Transport Canada et al., 2007). The power generation industry is especially interested in low-sulphur coal found in Montana and Wyoming which transits the Seaway via Superior, Wisconsin and other ports on Lake Superior downbound to power generating facilities in the densely populated regions around Lakes Michigan, Erie and Ontario. Also coal from Kentucky and West Virginia ships from U.S. ports on Lake Erie destined for Ontario.

While shipments of coal have not varied significantly in the Montreal to Welland Canal section within the last fifty years, coal traffic through the Soo Locks has risen significantly due to the demand for low-sulphur coal. By 2005 the volume of coal surpassed the volume of grain shipped through the port of Duluth-Superior (Kinnaird, 2010). Since then, the coal proportion has risen to 80% (Duluth Seaway Port Authority, 2011) which has forced the system to adapt by developing port facilities capable of loading and unloading larger volumes.

Recent developments in Ontario are set to reduce the volume of coal shipped from Kentucky and West Virginia via Ohio ports on Lake Erie. Ontario has no domestic source of coal and thus imported 21 million tonnes in 2004. Seventy-nine per cent of this amount was imported from the U.S. via Lake Erie, representing 42.1% of the total coal carried on the GLSLS. However, the Provincial Government of Ontario is requiring that coal no longer be used as a fuel source at power generation plants after December 31, 2014 (Kinnaird, 2010).

Container Movements

The container revolution in shipping has largely been absent from the GLSLS upstream of Montreal. This outcome is mostly due to the physical constraints that the Seaway imposes on vessel size. In general, the Port of Montreal has handled increasing volumes of container traffic and in 2010 handled over 12 million tonnes, a 31% increase in volume from 2000 (Port of Montreal, 2011). Although this traffic type represents only 0.1% of the total tonnage on the Seaway, many reports clearly look to container traffic growth on the Seaway as a major strategy moving forward (Marinova Consulting, 2005; Global Insight, 2006; Maritime Innovation, 2006; Transport Canada, U.S. Army Corps of Engineers et al., 2007; Transportation Economics and Management Systems Inc. and RAND Corportation, 2007; CPCS Transcom Limited, 2008; Marinova Consulting et al., 2009). A 20% toll rebate for container cargo is evidence of this strategic focus (The St. Lawrence Seaway Management Corporation and Saint Lawrence Seaway Development Corporation, 2011). The 2009 navigation season on the GLSLS saw container tonnage increase to a ten year high of 45,000 tonnes, a far cry from the 271,000 tons of 1978 (McCalla, 1994) but significantly higher than the 5,000 tonnes of 1998 (The St. Lawrence Seaway Management Corporation and Saint Lawrence Seaway Development Corporation, 2010).

1.4 Past Research

A useful transition into the next chapter on regulation is to provide a brief overview of some key GLSLS research on the marine mode that has preceded this report. Many of these sources are quoted throughout the document but the idea here is to give an overall sense.

A series of academic papers from the east coast (Brooks, 2000; Brooks and Hodgson, 2005; Hodgson and Brooks, 2007) give the best overviews of the marine regulatory context in Canada though not necessarily focused on the GLSLS. There is a lot of emphasis in these works on cabotage regulations including the Coasting Trade Act and the U.S. Jones Act as well as steps required for Canadian marine operators to compete on the international stage.

Two foundation reports for this work are provided by Marinova Consulting (2005) and Marinova Consulting et al. (2009). The earlier report was developed for Transport Canada and considers container-based short sea shipping scenarios between Halifax and Hamilton. The research suggests that the possibility to make a profit is theoretically possible for a service that also services Sept-Illes, Quebec as an intermediate point. The service would involve two vessels each of which would go back and forth in the context of a weekly route. The service would be a combination of domestic traffic and feeder elements from international liners at Halifax. It was only this combination that was found to

have a chance at profit, while many alternative scenarios were forecast to lose money. The detailed analysis was more on the cost side as opposed to the revenue side so there is no significant evidence provided that expected usage and revenues would actually be there.

The latter report by this firm in 2009 is for the Ontario Provincial government and is basically a detailed survey of all the elements that affect the functioning of the marine mode in the Ontario context. This report does put a lot of emphasis on regulatory aspects and their role in holding back the marine mode. There is a focus on the 25% duty on foreign built ships which was subsequently removed. Other reforms that are considered as important are ones that relate to cabotage, pilotage and human resources. All of these issues are examined in detail below.

CPCS Transcom (2008) has provided a report for Transport Canada on potential container-based short sea shipping scenarios in Eastern Canada involving domestic and feeder services. It is noted that most hub-and-spoke feeder operations in Eastern Canada have failed over the years as liners are not willing to commit until the service is proven and operators are reluctant to invest for fear that there is insufficient demand. The analysis considers over forty different hub and spoke combinations with seven different east coast hubs evaluated. Montreal is the most westerly of the hubs considered although feeder destination ports go as far inland as Chicago. The only hubs that are shortlisted in the end are Halifax, Montreal and Sept-Iles and some specific "spoke" combinations are identified that might have potential. None of these involve the GLSLS. One interesting aspect is that this report does not focus on regulatory issues as affecting these services but succeeds in showing that there are a whole host of non-regulatory factors that can cap the potential of the marine mode. The lack of year round operation on the Seaway is mentioned as one of these issues.

Probably the most optimistic report on the future of traffic levels (i.e. container-oriented) on the GLSLS is provided by Transportation Economics and Management Systems and the Rand Corporation (2007) in a report prepared for the U.S. Department of Transportation and Transport Canada. This report views the GLSLS as a whole and has forecast a set of Seaway traffic results based on a simulation model that considers the transport networks of the all the potential modes that function to serve the GLSLS basin. Various parameters that affect the functioning of the model are established through stated preference surveys with shippers. Interestingly, one of these parameters suggests that a 15% discount would be enough to compensate shippers for a seasonal closure of a marine service. Given such a discount, a shipper would apparently be willing to utilize the marine mode and find an alternative for the winter. The fact that many shipping contracts are short term in nature was viewed as providing the required flexibility.

Another major premise of the forecasts in the report is that congestion with the trucking and rail modes would build up to the point where some diversion of traffic to marine would be a necessity. The fact that congestion trends in place at the time of the study are being assumed to continue is quite apparent although caveats are provided. Not long after this research was completed the financial crisis and subsequent recession unfolded. The uncongested Seaway scenarios for 2010 offered container traffic estimates that proved wildly optimistic for marine. In 2050, for Hamilton-Halifax, 5.75 Million TEUs are forecast using a range of marine vessel types in the uncongested scenario. To add some perspective,

the Port of Montreal handled about 1.4 Million TEUs in 2011. Significant flows are also forecast between Hamilton and Duluth/Chicago. Another observation about this report is that there is little or no mention of regulatory impediments to the realization of its optimistic forecasts.

The Seaway Regulatory Environment

The efficient operation of the GLSLS, perhaps more so than the other modes, is very much dependent on the support of government. Apart from supplying an appropriate regulatory environment, government bodies are responsible for matters such as dredging and investing in infrastructure such as lock renewal. Complicating matters though is the fact that unlike air or highway transportation, there is no single agency to direct or co-ordinate activities.

The purpose of this chapter is to give a detailed overview of the regulatory environment and to consider the extent to which certain aspects have unfairly hindered Seaway traffic levels or will in the future. To this end, the first section highlights the wide array of stakeholders involved in the operation of the Seaway. The second section discusses some of the key marine legislation that is in place with an emphasis on the U.S. Jones Act and the Canadian Coastal Trading Act. The third section focuses on regulatory elements which result in fees and other charges that potentially reduce the attractiveness of the marine mode. The fourth section considers the extent to which environmental regulations have been a factor while the concluding section focuses on European marine policy and some of its best practices.

2.1 Stakeholders

In addition to the two nations that the GLSLS bisects, there are 2 provinces and 8 state governments that border the Seaway. Transport Canada, Environment Canada, the U.S. Department of Transportation (DOT) and the U.S. Environmental Protection Agency (EPA) are the main federal regulatory bodies. In Canada the GLSLS rests firmly within the mandate of the federal government as spelled out under Sections 91 and 92 of the British North America Act whereas in the United States the individual states of the GLSLS basin have the ability to legislate independent of the federal government (Marinova Consulting et al., 2009). There is little argument that this regulatory environment creates a great deal of uncertainty and hampers investment. The most obvious recent example was unreachable ballast water standards floated by the State of New York which could potentially have closed down the lower Seaway in 2013 (described further below).

The Government of Canada owns all the fixed assets of the Seaway on the Canadian side of the border. The St. Lawrence Seaway Management Corporation (SLSMC) is an associated, not-for-profit entity that gathers tolls in order to operate and maintain the St. Lawrence Seaway and its thirteen Canadian locks. The Saint Lawrence Seaway Development Corporation (SLSDC), which is owned by the U.S. DOT and funded through the Harbor Maintenance Tax (HMT), maintains the two American locks in New York State. The U.S. Army Corps of Engineers (USACE) manages the "Soo Locks" near Sault Ste. Marie and any water resource projects related to: navigation, flood control, shore erosion, ecosystem restoration and protection, and the maintenance of ports and harbours (Transport Canada et al., 2007). Coast guard services on both sides of the border are responsible for safety on the Seaway including maintenance of buoys, lights, channel markers and provision of ice breaking services.

Table 2-1: The Long List of Seaway Stakeholders

Type	Name	Role	Seaway Interests
Binational	Great Lakes Commission	Advocacy	Environmental, Economic
	St. Lawrence Seaway Development/Management Corporation	Management	Economic
	Highway H_20	Advocacy	Economic
	International Joint Commission	Management	Environmental
Canadian	Transport Canada	Regulatory	Economic
	Environment Canada	Regulatory	Environmental
	Transportation Safety Board of Canada	Regulatory	Economic
	Coast Guard	Management	Safety
	Border Services Agency		
	Citizenship and Immigration	Management	Economic, Safety
Provincial	Ontario Ministry of Transportation	Non-regulatory	Economic
	Transports Quebec		
U.S.	Army Corps of Engineers	Management	Safety
	Department of Transportation (DOT)	Regulatory	Economic
	Fish and Wildlife Service	Regulatory	Environmental
	Environmental Protection Agency		

	Department of Homeland Security	Management	Safety
	Maritime Administration	Non-regulatory	Promotion
	Coast Guard	Management	Safety
	Citizenship and Immigration Services	Management	Economic, Safety
State Transportation and Natural Resource Departments	Illinois	Regulatory	Environmental, Economic
	Indiana		
	Michigan		
	Minnesota		
	New York		
	Ohio		
	Pennsylvania		
	Wisconsin		
Shipbuilders	American Shipbuilding Association	Advocacy	Economic
	Canadian Shipbuilders Association		
Shippers	Shipping Federation of Canada		
	U.S. Shippers Association		
Pilots (CDN)	Great Lakes Pilotage Association	Management	Safety
	Laurentian Pilotage Authority		
Pilots (U.S.)	St. Lawrence Seaway Pilots Association		
	Lakes Pilots Association		
	Western Great Lakes Pilots Association		
Shipping Lines	Canadian Ship Owners Association	Advocacy	Economic
	(U.S.)Lake Carriers' Association		
	(Quebec)St. Lawrence Ship Operators		
Port Authorities	Association of Canadian Port Authorities		
	American Association of Port Authorities		
Terminal Operators	Canadian International Freight Forwarders Association		
	(U.S.) National Customs Brokers and Forwarders Association of America		
Associations	Supply Chain & Logistics Canada		
	Canadian Courier & Logistics Associations		
	The American Logistics Association		
Trucking Industry	Canadian Trucking Alliance	Competition*	Economic
	American Trucking Associations		
Rail Industry	Railway Association of Canada		
	Association of American Railroads		
Financiers/Investors	Banks, private investors etc.	Profit	Economic

* potential multi-modal transportation partners

In addition to federal and state governments there are many other Seaway stakeholders. Binational entities, arms-length pilotage authorities, shipbuilders, shippers, shipping lines, port authorities, terminal operators, logistics firms, trucking and rail industries, financiers and banks all have a stake in shipping on the Seaway and have different roles to play. The list is long and one of the most telling

aspects of Table 2.1 is that it is in fact too long to fit on a single page. It has been estimated that a marine carrier in cross border trade will need to comply with 30 sets of US and Canadian regulations administered by 10 different departments on federal and provincial levels.

Advocacy groups are interested in increasing traffic and/or environmental protection. Management stakeholders are either concerned with safety or environmental protection. Regulatory bodies enact the laws and regulations that dictate the regulatory environment, whereas non-regulatory government bodies are responsible for producing information about the Seaway. Competitors/partners like the rail and trucking industries act to undercut or support traffic on the Seaway. Meanwhile, private marine interests seek primarily to serve customers of marine services and profit from marine traffic. New strategies for increasing commercial traffic on the Seaway need to address these varied interests and the potential for conflict or unintended effects.

2.2 Key Marine Legislation

It is important to consider the circumstances under which regulations were first enacted to control maritime traffic on the Seaway and in the Coasting Trade in general. The marine mode is certainly the oldest of the major modes for the movement of goods but, if anything, this has proved to be a disadvantage. The basis for regulatory policy in the Seaway and North American context has its roots as far back as the American Revolution. Prior to the American Revolution, the British Empire reserved colonial shipping in both Canada and the U.S. for British vessels in order to protect the British shipping industry and to impose its power by controlling the flow of goods and people. After the American Revolution, the first act to protect U.S. shipping and shipbuilding was signed in 1789. The Act imposed duties on tonnage (Papavizas and Gardner, 2009) and established a preference towards U.S. vessels through the imposition of tariffs on imported goods. These tariffs would be reduced if shippers used vessels built, owned and registered in the United States. At this time, Canada remained a British colony and therefore access to Canadian waters and markets was reserved for British ships until long after confederation in 1867. In fact, Canada did not have jurisdiction over its own waters until the *Canada Shipping Act* of 1936, which also had as a focus the protection of British ships.

2.2.1 The Coasting Trade and Jones Acts

Coasting Trade refers to marine movements between two ports in the same country and these are also referred to as cabotage movements. At present, there are two major pieces of legislation which govern coasting trade and hence a large proportion of the movements on the Seaway. The protectionist Canadian *Coasting Trade Act* (CTA) and the U.S. *Jones Act* both have a very restrictive effect on the movement of domestic marine shipments on the GLSLS and elsewhere.

The essence of both acts is that cabotage movements must be carried out by a domestically flagged vessel, using a domestic crew. The U.S legislation goes a step further though as it requires the vessel to be U.S. built and majority U.S. owned. On this basis, the Jones Act is considered the more protectionist and this statement is even more true in the wake of the Canadian removal of the duty on foreign built ships. Some consider the scope of U.S. restrictions imposed by the Jones Act to be unparalled anywhere

in the world (Stewart, 2005) with those imposed by Canada not far behind. Under the Jones Act, there is no provision in the United States to allow foreign built vessels to handle domestic cargo at all; the vessel must be American built and registered.

It should be noted that protection of domestic transportation markets is not unique to the marine industry. There are similar restrictions with respect to air freight and trucking as well as people movement. In the airline industry for example, a foreign carrier arriving from abroad can certainly drop passengers off at New York before flying on to Chicago but it would not be permitted to pick up passengers in New York as this would be viewed as participating in domestic trade.

The Jones Act emerged from the 24th and 27th chapters of the *Merchant Marine Act* of 1920. The Act states that domestic cargo may not be moved by water between two U.S. ports unless it is transported on a vessel that is built and owned by a U.S. citizen. These cabotage portions of the Act collectively became known as the "Jones Act" after its sponsor, Senator Wesley Jones. The act represents the direct descendant of the 1789 act: *An Act Imposing Duties on Tonnage* that had been modified six times over the years in order to deal with an evolving economy and world (Papavizas and Gardner, 2009). The Act also reflected the fact that in WWI, the U.S. was caught with a completely inadequate merchant marine fleet. The Jones Act sought to ensure that such an occurrence would not happen again and also sought to ensure that there would be ample numbers of experienced American sailors.

The Jones Act was originally meant to sell World War I merchant vessels earlier built by the U.S. Government. The idea was that U.S. citizens would buy such vessels in order to raise revenue for the government and to help maintain a fleet of domestic merchant vessels loyal to America in case of national emergencies (Papavizas and Gardner, 2009). Cabotage was not addressed in the bill directly but was an unintended consequence of a national security bill.

The national security element of the Jones Act is considered fundamental in U.S. circles and is one of the main reasons that it has proven very difficult to overturn or relax. Senator John McCain called for the repeal of the Jones Act in 2010 on the basis of a 2002 economic study by the U.S. International Trade Commission which suggested that the Jones Act costs the U.S. economy $656 million annually (Bonney, 2010) although it also generates profits for protected American shipbuilders. Note, however, that the strongest arguments for repeal relate to water-bound states such as Hawaii. There is ample evidence there that the restrictions of the Jones Act have a large impact in driving up consumer prices. In the context of Hawaii, there is little alternative to marine for the shipping of most goods; in the Seaway context, there are some strong modal alternatives. One other point of interest that argues against the Jones Act is that U.S. ships carry less than 3% of U.S. imports and exports.

In Canada, the CTA came into force in 1992 as a result of the abandonment of the *British Commonwealth Merchant Shipping Agreement* in 1979. The latter reserved shipping and ship imports to Canada for the commonwealth nations including the U.K., Australia, New Zealand, South Africa, Ireland and Newfoundland and Labrador. In both, the protection of domestic shipping was achieved by protecting access based on registration and payment of duty depending on the country of build (Hodgson and Brooks, 2007).

Shipments between Canadian ports remain restricted to Canadian flagged vessels which are generally more costly to operate compared to foreign flagged vessels. As of 2006, there are no Canadian registered ships operating exclusively in international trade because the conditions imposed on Canadian flag vessels such as safety, crewing, and taxation are too onerous to compete with foreign flagged vessels which need only meet laxer international safety standards (Hodgson and Brooks, 2007). Canadian flagged vessels, therefore, serve domestic shipping only, and in doing so are protected from any competition from foreign flagged vessels.

Implications of the CTA for shippers include higher crewing costs, higher costs due to stringent safety regulations, and costs associated with operating an aging vessel including higher maintenance, fuel consumption, and insurance. The removal of the 25% duty, of course, is helping to address the problems of aging vessels. In the U.S., apart from its impact on places like Hawaii, the Jones Act is criticized for negative impact on new entrepreneurial shipping ventures and its dampening effect on the import of new shipping technology.

From a short sea shipping perspective, coasting trade policy greatly reduces the possibility to define certain profitable "triangular" routes with more stops between the two countries (Marinova Consulting et al., 2009). In a 2005 study, Transport Canada examined the Act and found essentially that it had no negative impacts although the same study suggested that more could be done to improve matters under NAFTA (Marinova Consulting et al., 2009). Subsequent removal of the 25% duty in 2010 suggests that this conclusion was re-visited to some extent.

2.2.2 Domestic versus International Shipping

In Canada, domestic and international shipping are treated rather as two solitudes. The Coasting Trade Act, as described above, is quite protectionist and assures that Canadian firms are in control of the domestic trade. Previously it was very difficult for Canadian firms to be competitive in international trades because such firms were taxed on their worldwide income. Meanwhile, international shipping companies were using “flags of convenience” and essentially operating in a near zero tax environment.

Out of concern that Canadian internationally oriented ports and Canadian based international shipping was in serious danger of lagging behind, the Canadian Government changed its policy with respect to international shipping and formally created the International Shipping Corporation (ISC). To this end the Canada Shipping Act was modified in 1998. The end result was that a shipping firm could have its “mind and management” in Canada but not be taxed as a Canadian firm if the main business was international shipping and if the firm were actually incorporated outside Canada. Meeting such criteria would define the firm as an ISC and imply that internationally sourced income would not be taxed although domestically sourced income would be (Brooks and Hodgson, 2005). In this way, Canadians could be competitive in international shipping although they would make extensive use of internationally flagged vessels to do it. There is apparently no Canadian flagged vessel that is involved exclusively in international shipping (Marinova Consulting et al., 2009).

With respect to the coasting trades that are quite relevant to the Seaway, the net result is that to the extent incomes are derived from domestic movements, they are fully taxable just as the incomes of any

Canadian corporation. U.S. firms, on the other hand, benefit from an income neutral taxation policy based on the tonnage tax approach. Taxes are derived with reference to the net tonnage of the vessels owned and operated by the firm. The profit that is made on each shipment is not relevant in calculating tax. Rates are so minimal that it is essentially a zero tax policy where annual amounts can be accurately predicted based on the size and number of vessels in service (Brooks and Hodgson, 2005). This policy is also neutral as to whether the firm is international or domestic. Because the tonnage shipped on the Seaway between U.S. ports is limited due to physical constraints (vessel size), domestic shipping is taxed at an even lower rate than international shipping.

By way of comparison, a Canadian 17,000 net ton vessel generating $1.6 million in revenue over the year is responsible for $264,000 in taxes while the same ship with the same revenue taking part in U.S. domestic shipping on the Seaway would be taxed $8,813 (National Archives and Records Administration, 2011). In this respect domestic shipping is more profitable in the U.S. but the coasting trade regulations essentially allow the two sets of domestic fleets to operate in parallel in the region with little overlap.

Countries that are concerned with their standing in international shipping, where the primary transport assets are highly mobile, have tended to favour the tonnage tax approach in an effort to preserve local maritime skills and also to strengthen safety and environmental protection. It has been observed that conventional taxation appears to hurt the shipping industries of countries that maintain such policies (Brooks and Hodgson, 2005). In response the Netherlands, for example, was the first in Europe to adopt the tax in 1996 has recently been broadening the terms of its tonnage tax to accommodate even more types of ships. To take advantage of the low rates, firms must adopt the European flag.

2.2.3 Protecting Shipbuilding and the Duty on Imported Ships

One very prominent trend in Canada and North America is that shipbuilding, especially for non-military purposes, has become very uncompetitive. The trend gathered force in the period after World War II when the Japanese built modern and efficient shipyards that became very difficult to compete against. At the end of World War II Canada had the 4th largest merchant fleet in the world. Other Asian shipbuilding powers have since emerged such as Korea and China. Meanwhile, certain European countries are quite competitive in shipbuilding in targeted niches. Perhaps due to historical precedent and the associated importance of having strong marine capability, the Canadian government insisted on a protectionist duty against foreign built ships to maximize the chances that ships would be built in this country. In retrospect, the forces of economic efficiency in shipbuilding overwhelmed any local advantages facilitated by the duty.

An unintended consequence of the duty provision is that the Canadian cargo fleet is among the oldest in the world with more than 80% of the fleet over 25 years old (Research and Traffic Group, 2009; Brooks, 2006). In fact, the Canadian shipbuilding industry has been so uncompetitive that it has not been able to build a new Seaway-Max vessel for almost thirty years. At the time this last vessel was made, it was four times more expensive than a comparable South Korean-made ship (Brooks, 2006). Actually paying the duty was a costly choice to make but since modern imported ships offer greater capacity, speed and lower fuel consumption and emissions, some companies believed there was little choice. Prior to

removal of the duty, Algoma Central Corporation, for example, paid $7.6 million to import the tanker *Algo Canada* and put into operation for January 2009 (Pung, 2010b). It has been suggested that in essence, the federal government had been guilty of confusing goods movement policies with industrial (shipbuilding) policies (Marinova Consulting et al., 2009) when really the two are not directly related.

On October 13, 2010 (Government of Canada, 2010) the CTA was amended to effectively remove the 25% duty on imported ships. Already there is evidence of vessel renewal. Algoma Central, Upper Lakes Group Inc. and the Canadian Wheat Board recently ordered a total of eight new Equinox Class freighters at $400 million that emit up to 60% fewer emissions and conform to the latest environmental regulations (Algoma Central Corporation, 2011). The removal of the 25% duty gives some sense of the power of regulation in either encouraging or discouraging new investment relevant to the Seaway.

2.2.4 Trade Liberalization and the Marine Mode

While trade between Canada and the United States has been very significantly liberalized over the past 25 years, it is important to note that the two countries have never formed a customs union, let alone a common market. Canada, the U.S. and Mexico have a trade agreement in place for which tariffs have been eliminated on most goods shipped between the countries. However, the countries do not have common external tariffs in place, as would be the case in a customs union, so there can be distortions from the economically efficient pattern of international goods movements with North America as shippers exploit the most favourable tariffs. In the common market scenario, of course, there is free movement of capital and labour between member nations and common tariffs to the outside world.

Initially the *Canada-U.S. Trade Agreement* (FTA) came into effect and was then superseded by NAFTA which came into force in 1994. NAFTA was highly successful in generating more trade between the nations of North America. In the first five years of the agreement, trade between each partner approximately doubled (Brooks, 2000). However, the promise of NAFTA as it related to marine transportation was for the most part not realized. The U.S. did gain access for U.S. built vessels to the Canadian coasting trade but no reciprocal agreement was forthcoming.

In contrast to European liberalization, which has gone much further, NAFTA was never intended to permit its members access to domestic cargo movements in the other two member countries. No progress has been made on a new NAFTA cabotage regime since the signing of NAFTA. During negotiations, Canada pursued the idea of liberalizing the marine sector by relaxing cabotage and investment restrictions. But negotiators from the U.S. side steadfastly defended the Jones Act despite the global trend toward marine liberalization (Brooks, 2006). As for international cargo, NAFTA proposed to phase out rules that restricted Canadian companies from shipping to Mexico via the U.S. by rail and road. Canada sought a new investment arrangement for marine shipping that would include guarantees for investors on the expropriation of assets and minimal restrictions on the sale and re-flagging of vessels between member countries. The U.S. side did not wish transportation services to fall under the dispute resolution process being drafted for NAFTA. Instead, they proposed a setup under the U.S. *Foreign Shipping Practices Act of 1988* (Brooks, 2006).

Undeterred, Mexico and Canada agreed upon a deal that excluded the U.S. and which opened international shipping services to the flag of the other country. As a result, rail modal share of Mexican-Canada trade declined from 27% in 1990 to 9% in 1998 and marine modal share increased from approximately 17% in 1990 to around 40% in 1998 (Brooks, 2000). Marine liberalization proved to be an effective policy tool in promoting marine traffic between these two nations. It has been suggested that the Canadian federal government be strongly lobbied to persist in the liberalization of marine cabotage under NAFTA (Marinova Consulting et al., 2009).

NAFTA has had more U.S. success with the other modes. In the trucking industry, there have been compromises on vehicle dimensions, weight and other standards that related to transportation capital equipment. Efficiencies related to the licensing of vehicles and drivers have helped increase the integration and ease the flow of cargo across borders. Trucking trade between Mexico and Canada has benefitted from the ability to move goods via the U.S. and also to pick up domestic cargo bound for U.S. states en route to the origin nation (Brooks, 2000). Firms gained the ability to create or purchase a shipping company in another NAFTA country with the restriction that the drivers and equipment be from the host nation (Brooks, 2000).

With rail, firms gained the ability to partner or outright purchase rail lines from other NAFTA nations which has meant that cargo may now travel from a Canadian destination to an American destination on Canadian National (CN) based on CNs ownership of rail lines extending downstream of the Mississippi River provided the labour is American along the U.S. portion of the trip (Brooks, 2000). CN's U.S. operations are owned via a subsidiary which is incorporated in the United States.

2.2.5 Other Policy Measures

As a result of the financial crisis of 2008, the Canadian Government provided significant funding, primarily for infrastructure in its *Economic Action Plan* which includes $104 million for improvement of marine facilities (Government of Canada et al., 2007). The 2011 federal budget commits the government to work with local and provincial governments to develop long-term infrastructure plans beyond the 2014 expiration of the *Build Canada Plan* which was established before the financial crisis. In this most recent budget the Atlantic and Continental Gateway strategies will draw $52 billion in municipal transportation infrastructure investment from the Gas Tax Fund (Wasserman, 2011). There is also a focus on developing infrastructure investments through public-private partnerships (Wasserman, 2011).

In Quebec, the *Quebec Marine Transportation Policy: Quebec at the Helm* in 2001 (Government of Quebec, 2001) was released largely with the goal of promoting marine activity. In 2004, the Short Sea Shipping Roundtable was setup by the Quebec Ministry of Transport (Transports Quebec, 2011) and has since met ten times in the last five years to address key priorities. The Quebec government invested $20 million to support start-up marine transportation projects and promote intermodal infrastructure (Maritime Innovation, 2006). The Maritime Assistance Program (2001-2005) and the Assistance Program for Modal Integration (2006-2010) have provided financial support for short sea shipping projects based on recommendations in the *Quebec Marine Transportation Policy*.

In the United States, the Department of Transportation introduced *America's Marine Highway Program* that identified three marine corridors within the GLSLS that could offer relief to landside traffic congestion and pollution (U.S. DOT Maritime Administration, 2011a). One was a new ferry service to provide a border crossing alternative to the Ambassador Bridge and Detroit-Windsor Tunnel. To support U.S. shipbuilding the U.S. DOT Maritime Administration offers loan guarantees, tax-deferral, support for capital investments and provides assistance to small shipyards for improving working capital (U.S. DOT Maritime Administration, 2011b). The National Maritime Resource and Education Center (NMREC) was established to provide expertise, information and reference material to marine stakeholders and to improve competitiveness (U.S. DOT Maritime Administration, 2011b).

2.3 Fees and Other Charges

2.3.1 U.S. Harbor Maintenance Fee

The U.S. Harbor Maintenance Fee (HMF) was created by the *Water Resources Development Act* of 1986. The concept was to recoup funds at ports which have used federal resources for harbour construction, maintenance and operation (Marinova Consulting et al., 2009) and to fund the Saint Lawrence Development Corporation. The fee is calculated as 0.125% of the value of the cargo, which works out to $1.25 per $1000 value of cargo. The fee was actually tripled to this level in 1990. A tax on value was chosen rather than a tax on tonnage to minimize the impact on bulk goods which predominate on the Seaway. For most bulk goods, the fee would normally work out to between four and six cents per tonne. On the other hand, higher value goods associated with, for example, a 20 tonne truck load could see a fee of $50 to $200 depending on the value of the goods (Wright, 2003).

In 1998 the U.S. Supreme Court found that the Harbor Maintenance Tax (as it was called at the time) was unconstitutional for exports on the grounds that it was not a fair approximation of the use of services, facilities or the accrued benefits to the exporter (Stewart, 2005). The levy became a "fee" as opposed to a tax and continued to apply to domestic movements and imports.

There is little doubt that the HMF reduces the potential for marine trade between the U.S. and Canada. One anecdotal example relates to the Detroit-Windsor truck ferry which was developed primarily to carry trucks with dangerous goods that are not allowed to cross at the Ambassador Bridge. Apparently, because of the HMF, there is much more truck flow in the direction of Windsor than Detroit. U.S. bound trucks are opting to take the longer route which crosses at Sarnia rather than triggering the HMF fee.

There is no limit on the number of voyages that can be taxed so a short-sea shipping service that ran frequently between the countries would soon be billed far beyond any required harbour maintenance that the service would cause. The fact that the fee is based on value in a way confirms a stereotype that the Seaway is less useful for the movement of high value goods since those would be taxed quite highly.

While the fee itself is something of a concern, especially for high value goods, the administrative burden it imposes is even more onerous. Ultimately, fees are charged back to the shipper so movements that involve multiple, small shipments would involve something of an administrative nightmare since each unique component needs to be accounted for separately.

The HMF has always been controversial and different stakeholders have sought its removal. Recently the U.S. *Short Sea Shipping Enhancement Act* of 2007 (H.R. 981) and 2009 (H.R. 3486), which proposed changes to the HMF, failed to pass into law. A new bill (H.R. 1533), the *Short Sea Shipping Act* of 2011, would exempt Seaway traffic between Canada and the U.S. and is currently before Congress. This new legislation is focused on non-bulk cargo in recognition of the suppressive effect that the HMF has on the movement of smaller, higher value shipments.

2.3.2 Pilotage

Pilotage refers to the need for specialized operators to board a vessel and navigate it through their local geography. Marine pilots are common for certain canals, locks and water courses that have little room for error. The pilots either assume control of the vessel or assist with vessel navigation through the compulsory pilotage areas. The cost of hiring a pilot depends on the section of the Seaway being traversed, the size of the ship, time of season, amount of cargo, and a number of additional fees.

The GLSLS is comprised of an area that falls under the compulsory pilotage regulations of five pilotage authorities. Two of these authorities are Canadian and three are American. Where there is overlap between Canadian and American pilotage areas, duties are shared between the associations. Only Lake Michigan and the section of the St. Lawrence east of Montreal are sovereign waters.

Within the Canadian jurisdiction of the Seaway, the Laurentian Pilotage Authority and the Great Lakes Pilotage Authority have different regulations. The two authorities are in agreement about the need for a pilot with a foreign vessel passage but there are differences for domestic vessels. Under the Laurentian Pilotage Authority Regulations (Government of Canada, 2011) all Canadian vessels above a certain size must carry a pilot and cover the costs associated with having one aboard. The Great Lakes Authority has a similar provision but permits exemptions for certified officers who, within the past three years, have competed ten transits of the zone in question (Government of Canada, 2011). Effectively this exemption means that Canadian and U.S. flagged and crewed vessels operating primarily on the GLSLS are exempt from compulsory pilotage.

Cost implications of the Laurentian Pilotage Authority regulations can be significant. For smaller feeder type vessels entering the Seaway and traveling to Montreal the typical pilotage charge might be $4,400 per direction and for larger bulk vessels, the cost is significantly more at perhaps $17,000 per direction (Marinova Consulting et al., 2009). Apparently, these pilotage costs are very competitive with those of other jurisdictions in the world such as the Ports of Houston and Rotterdam as well as certain ports on the west coast. During winter, multiple pilots are required which increases these costs even further. Of course, this time period coincides for the most part with the closure of locks upstream.

The pilotage issue is a complex one and there appear to be strongly differing viewpoints from different stakeholders (Turner and Clavelle, 2007). Some anecdotal evidence suggests that Captains use the pilotage services in the Quebec-Montreal section of the Seaway to either recover from or prepare for the 24 hour journey between Montreal and Lake Ontario and through the Seaway locks. As such, they might not be the stakeholders most strongly opposed to the compulsory pilotage for those areas. Some captains are not bilingual which can be an issue without a pilot. Meanwhile, some ship-owners want maximum flexibility in compulsory areas in terms of who pilotage services can be purchased from. There have been calls from members of this group for the Pilotage Act to be completely revamped. Both Canadian pilotage authorities on the Seaway are mandated as crown corporations to be financially self-sufficient. It has happened that the measures required to reach this objective can be a source of frustration for the purchasers of the service.

2.3.3 Customs

There are also issues related to customs clearance for international shipping. On the Canadian side, the Canada Border Services Agency (CBSA) has a cost recovery fee and restrictions imposed by hours of operation. On the U.S. side, the Department of Homeland Security requires 24 hours notice prior to vessel arrival and processing. The CBSA currently charges a fee for any new marine service that crosses the GLSLS from the United States. The purpose is to recover the cost of providing customs service. American vessels must arrive at the Canadian port of delivery during certain hours of operation or otherwise be forced to pay overtime for the CBSA agent. The port of Hamilton CBSA office, for example, is only open during regular business hours. This situation is common among Canadian ports on the Seaway. Apart from the potential for delaying shipments, there is the issue of a $100/hour recovery fee for having an agent available at the port of call and possibly a larger amount if the agent is working overtime (Marinova Consulting et al., 2009).

2.3.4 Coast Guard Charges

Up until the late 1990s the Canadian Coast Guard (CCG) provided services such as dredging and icebreaking for free along the Seaway. During the late 1990s extensive research supported the implementation of fees (for navigation services, icebreaking and dredging) payable to the CCG by ships transiting the Seaway en route to a Canadian port (Marinova Consulting et al., 2009). These fees sought to recover the cost for services that historically had been subsidized by the U.S. and Canadian federal governments. The CCG fees, with the exception of the dredging fee, recover only a portion of the costs associated with vessels (Marinova Consulting et al., 2009). Meanwhile, the Harbor Maintenance Trust Fund (HMTF) which funds harbor maintenance, dredging and other services is over-funded at a rate of hundreds of millions of dollars per year (Wasserman, 2011).

The *Marine Navigation Services Fee* came into effect in Canada in 1996. Its amount varies depending on the registration of the vessel, the distance and zones being transited, and the cargo. This fee is not charged to vessels transiting the Seaway en route to or from U.S. ports. In that context, a similar type of fee for American vessels is recouped with the HMF.

For dredging services on the American side of the GLSLS, the U.S. Army Corps of Engineers provides the service which is funded through appropriations from the HMTF. On the Canadian side, the CCG provides the services funded through the 1997 *St. Lawrence Ship Channel Maintenance Dredging Services Tonnage Fee.* This fee, which is charged at $0.0345 per transit per Gross Registered Tonnage, is charged to commercial vessels en route to or from a Canadian port upstream of Montreal. This dredging fee recovers 100% of the dredging services cost.

Vessels bound for Canadian ports on the GLSLS during "ice season" are required to pay a fee for ice breaking whether the ice breaking service is required or not (Marinova Consulting et al., 2009). Shippers must pay a fee of $3,100 for each ice zone transited between December 21 and April 15 for transits on the St. Lawrence River East of Montreal and between December 21-24 and April 1-15 on the MLO section of the Seaway. Vessels bound for a U.S. port are not required to pay this fee or any other fee to the U.S. Coast Guard as icebreaking services are provided for free.

2.3.5 Tolls

Transiting the Montreal-Lake Ontario and/or Welland Canal sections of the Seaway requires that a vessel pay a predetermined toll depending on the tonnage and the cargo type being transported (The St. Lawrence Seaway Management Corporation, 2011). Table 2.2 displays the exact rates that shippers must pay depending on the context. In 2010, these tolls amounted to over $60 million. No tolls are charged for the two American locks in New York State operated by the SLSDC and those operated by the U.S. Army Corp of Engineers at Sault Ste Marie although the harbor maintenance fee compensates.

Table 2.2 outlines some interesting differences between the Montreal-Lake Ontario section of the Seaway and the Welland Canal. The tolls at the Welland Canal are much lower for several types of cargo and marginally higher for two other although charges related to Gross Registered Ton (GRT) are higher in the Welland Canal. Since 2008 tolls have been frozen and these same rates will apply for the upcoming 2012 season.

For 2012, three distinct toll incentive programs will be in place: the New Business Incentive, Volume Rebate Incentive and the Service Incentive Program. The New Business Incentive Program offers a 20% toll discount on new cargo movement service for origin-destination combinations that are approved as "new business" (Highway H2O, 2011). The new business definition and associated savings can stay in place for up to three years. This incentive has generated results that are ahead of expectations (Kinnaird, 2011). The Volume Rebate Incentive Program offers a 10% toll discount on cargo that has exceeded a certain defined volume threshold. Shippers are thus incentivized to move ever larger amounts via the Seaway. Finally, the new Service Incentive Program offers a 20% toll incentive for new liner or semi-liner services that export cargo from GLSLS ports to ports around the world. This service must consist of multiple commodities and must provide a minimum of four Great Lakes calls during the

Table 2-2: Toll Rates by Commodity and Seaway Section ($/tonne)

Cargo Tolls	MLO	Welland
Bulk cargo	$1.0012	$0.6834
Grain	$0.6151	$0.6834
Coal	$0.6151	$0.6834
General Cargo	$2.4124	$1.0936
Steel Slab	$2.1833	$0.7829
Containerized Cargo	$1.0012	$0.6834
Government Aid	$0	$0
GRT Charge	**MLO**	**Welland**
Loaded or Ballast Vessels	$0.0966	$0.1546
Minimum Charge	**MLO**	**Welland**
Minimum charge per ship per lock transited for full or partial transit of the Seaway	$25.00	$25.00
Lockage Charge (per GRT)	**MLO**	**Welland**
Loaded or Ballast Vessels	N/A	$0.2575
Maximum per vessel	**N/A**	**$3,600.00**
Under the New Business Initiative, for cargo accepted as new business, a percentage rebate on the applicable cargo charges for the approved period	20%	20%
Under the Volume Rebate Initiative, a retroactive percentage rebate on cargo tolls on the incremental volume calculated based on the pre-approved maximum volume	**10%**	**10%**

Source: St. Lawrence Seaway Management Corporation, 2011

season (The St. Lawrence Seaway Management Corporation and Saint Lawrence Seaway Development Corporation, 2011). Prior to 2008, lockage fees where a flat rate fee which charged small vessels the same amount as a Seaway-Max vessel thereby discouraging the use of fit-for-purpose vessels that could provide a more efficient way to transport a small or medium amount of cargo. Lock tolls are now variable based on the tonnage transiting the locks which allows smaller shipments to take advantage of economies of scale for shorter voyages (The St. Lawrence Seaway Management Corporation and St. Lawrence Seaway Development Corporation, 2011).

2.4 Environmental Regulations

Development in the GLSLS basin and transportation of goods on the GLSLS is not without environmental impact. The GLSLS is the largest fresh water system in the world and supports the activity of people and organizations by providing drinking water, power, and a navigable transportation system for both recreational and commercial purposes. Development of urban areas which are home to twenty six million inhabitants and agricultural land to feed these people accounts for almost half the area of the GLSLS basin (Transport Canada et al., 2007). This human activity places significant pressures on the

ecosystem which has resulted in an environmental regulatory framework to manage these potentially harmful impacts.

A GLSLS study (Transport Canada et al., 2007) discussed the diversity of the GLSLS ecosystem by focusing on valued ecosystems components (VECs) in order to reveal those components that have the greatest relevance in terms of value and sensitivity (Table 2.3). For the purposes of this report, only regulations that incur costs to shippers, and potentially reduce competitiveness and traffic on the Seaway are considered. Such regulations are essential to maintaining the health of the ecosystem components of the Seaway. However, if not carefully implemented, they threaten to shift tonnage to more costly and less environmentally friendly modes of shipping. The net result could be negative for the environment.

Table 2-3: Valued Ecosystem Components Relevant to the Seaway

VEC Groups	VECs	VEC Description
Air	Air Quality	Nitrogen oxides (NOx), sulphur oxides (SOx), carbon dioxide (CO_2), dust and other particulate matter (PM)
Terrestrial Ecosystems	Soil and Groundwater	Contamination
	Vegetation	Limited to near-shore and upland vegetation
	Fauna	Terrestrial fauna excluding aquatic birds and shorebirds
	Special Features	Islands
Aquatic Ecosystems	Water and Substrate	Water quality, water quantity, and substrate
	Flora and Wetlands	Wetlands and phytoplankton
	Aquatic fauna	Fish, benthic invertebrates, zooplankton, semi-aquatic species (e.g. amphibians, reptiles, waterfowl, shorebirds, etc.)

Source: Transport Canada et al., 2007

2.4.1 Aquatic Invasive Species and Ballast Discharge Regulations

Due in large part to commercial shipping on the Seaway, which has attracted vessels from all over the world, more than 180 aquatic invasive species (AIS) are estimated to currently inhabit the GLSLS (Marinova Consulting et al., 2009). In the absence of natural predators, these foreign species are able to multiply rapidly and out-compete native species. The populations of native species suffer. Once established, the spread of invasive species to the entire drainage basin is extremely hard to control. This issue is of paramount importance to Seaway stakeholders, including environmentalists, who have gone as far as suggesting that the Seaway be closed to international shipping. A more measured response, from stakeholders who benefit from traffic on the Seaway, has been to promote the inspection of ballast water which tends to introduce such species.

In March 2008, the two Seaway corporations established uniform and stringent ballast water management standards that require vessels from the ocean to flush ballast tanks with salt water in order to kill any new AIS that might enter the system. As of 2010, 100% of seventy one vessels bound for the Seaway from the ocean received ballast tank exams which were successful in preventing any new invasive species from being introduced (The St. Lawrence Seaway Management Corporation et al., 2011). These stringent requirements led Fisheries and Oceans Canada to conclude that the risk of

ballast water introducing any further species is now extremely low. It is possible to inspect 100% of vessels that transit the locks at Montreal to access the Seaway (Pung, 2011c).

Another report (Transportation Research Board, 2008) went to the extent of studying the complete closure of the Seaway to trans-oceanic shipping as a way to eliminate the potential for further AIS. In the end it was concluded that such a drastic approach would not be feasible because it potentially could do great damage in an economic sense and could not guarantee that other AIS would not be introduced. As well as shipping, there are other means to introduce AIS into the Great Lakes such as recreational boating, angling or bait fishing, aquaculture, commercial and home aquaria, water gardens, canals and rivers. Collectively, these account for a significant proportion of the total risk.

Regardless of recent progress in fighting AIS and the significant evidence that inspection is working, commercial shipping remains threatened by the possible imposition of unilateral regulations by U.S. states for tougher ballast management. Eight individual U.S. states of the GLSLS have this power over their portions of the Seaway, a situation which has led to considerable uncertainty for commercial interests. Federally, Canada and the U.S. support international ballast water standards. While the Government of Canada has strong regulatory power in this matter, the U.S. federal government exercises some control over ballast regulations but also empowers state governments.

Up until the release of a feasibility study by the Wisconsin Department of Natural Resources (Wisconsin Department of Natural Resources, 2010), the state of Wisconsin required vessels operating in its waters to install ballast water treatment systems that are 100 times more capable of removing invasive organisms than systems approved by the International Maritime Organization (Pung, 2010a). However, the feasibility study determined that there is no current technology available to test the compliance with these regulations. Instead, it was recommended that the state follow international ballast water discharge rules.

Similarly, the State of New York was recently threatening to require ballast water regulations 100 times more stringent than international standards despite the Wisconsin Department of Natural Resources report. These regulations, were set to take effect August 1, 2013 and could have negatively impacted 50% of GLSLS shipping by bottlenecking the system at the two locks under state jurisdiction. The standards would have required massive expenditures for the ship owners of the 250 Canadian and U.S. vessels that would have required appropriate treatment systems (Pung, 2011c). The state of Minnesota is requiring similar treatment systems by 2016, joining the state of Michigan in creating a patchwork of American state regulations that are currently not supported advocated by experts. This uncertainty with the future of ballast water regulations creates an unpredictable policy environment for long-term investment. The U.S. Coast Guard expects to release a national standard for ballast water management in the hopes of creating a unified policy environment on this issue (Pung, 2011c).

2.4.2 Water Levels

Long-term changes in water levels have historically been caused by cycles of precipitation. These caused low water levels in the 1960s and above average water levels in the early 1970s and mid-1980s (Marinova Consulting et al., 2009). Since 1986, water levels have been declining from climate change,

reaching all-time lows in 2007. Currently Lakes Superior, Huron, and Michigan are well below long term averages, whereas Lakes Erie and Ontario are around average (Pung, 2011c).

Shipping profitably is very much affected by water level changes because maximum allowable draft dictates how fully a ship can be loaded and a water level loss of a few inches can reduce the profit margin for a particular shipment. Generally, every inch lost in vessel draft is equivalent to 270 less tons of cargo for a typical laker (Pung, 2011c). To a certain extent, water levels may be regulated at Sault Ste Marie and Cornwall using dams and other control structures. The protocol for doing so was established under the International Joint Commission (IJC) and the *Boundary Waters Treaty.* Nevertheless, this ability to control water levels would be overwhelmed by potential catastrophic drops of up to a metre predicted by some climate models (Marinova Consulting et al., 2009).

Adding urgency to the issue is the backlog of dredging required to maximize the allowable draft at U.S. ports. Currently, low appropriations from the HMTF to the U.S. Army Corps of Engineers for dredging services have caused the fund to swell to $5.6 billion. With only 40% of the required dredging being done each year there is an accumulated 15 million cubic meters of backlogged dredging (Pung, 2011d). As a result, certain vessels on Lake Superior that would normally handle 17,000 tons of cargo are routinely carrying only 15,000 tons in order to access certain U.S. harbours. This has reduced shipper profits by an estimated 12%.

2.4.3 Air Quality

Air quality regulations on the Seaway take the form of emissions controls on vessels operating on the system. Canada and the U.S. are signatories of MARPOL, the International Convention for Prevention of Pollution from Ships, which includes all types of ship generated pollution. Air pollution as a result of exhaust from vessel operation is regulated in Annex VI which sets limits for NOx, SOx, and particulate emissions (Marinova Consulting et al., 2009) and is a standard the shipbuilding industry has been able to meet. Where Canadian waters are regulated under these guidelines, the GLSLS U.S. states have the authority to enact regulations of their own as they see fit. Again, this reality contributes to a less certain business environment.

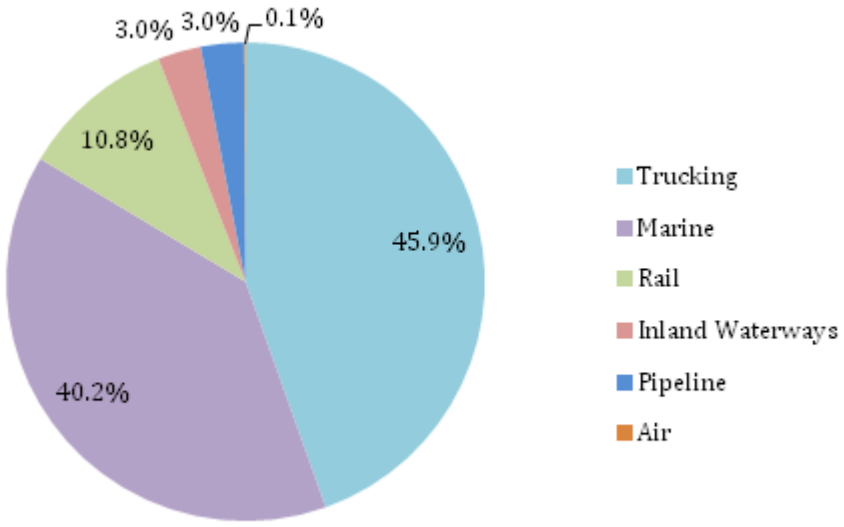
Further uncertainty has been caused by the unilateral decision of April 30, 2010 (Ryan, 2010) by the EPA to extend the International Maritime Organization (IMO) Emission Control Area (ECA) to include the GLSLS. This extension would require Seaway vessels to comply with emission standards that were formerly meant to apply only to ocean going vessels. The new regulations, to be implemented in 2012, would require reducing sulphur content in fuel to 1% by 2012 and 0.1% in 2015. The comparable global standards are 3.5% sulphur content by 2012 and 0.5% by 2020. Older ships (the bulk of the GLSLS vessels) would be required to use more expensive marine diesel oil (MDO) by 2012 and marine gas oil (MGO) by 2015 (Research and Traffic Group, 2009). Most vessels currently use a blend of heavy residual fuel oil (bunker C) and MDO.

A report prepared by the Canadian Shipowners' Association (Research and Traffic Group, 2009) calculated that the average rate increase to transit the Seaway would be 11% for 100% MDO fuel and 14% for MGO. As a result, the study forecast a potential 20% modal shift from marine to alternative

modes and a resulting net increase in air pollution. The high average age of the Canadian and U.S. fleets on the Seaway exacerbates potential cost increases since older vessels use primarily bunker C. A vessel using 100% bunker C would experience an 86% fuel cost increase and a rate increase of 20%. Cost increases of these levels could significantly threaten the Seaway competitiveness.

As of the end of 2011, it appears that the Canadian Government is settling on a more measured "fleet averaging" approach to the issue in order to give Canadian fleets some time to adapt to the new standards. Compliance is not assessed on the basis of each vessel but rather the average of sulphur emissions across a firm's entire fleet. By August 1, 2012 a fleet average of 1.5% sulphur content is required across the fleet. By 2020, the target is 0.1% but each vessel is to be in compliance.

Figure 2-1: Intra-EU Freight Modal Split in 2008 (tonne-km)



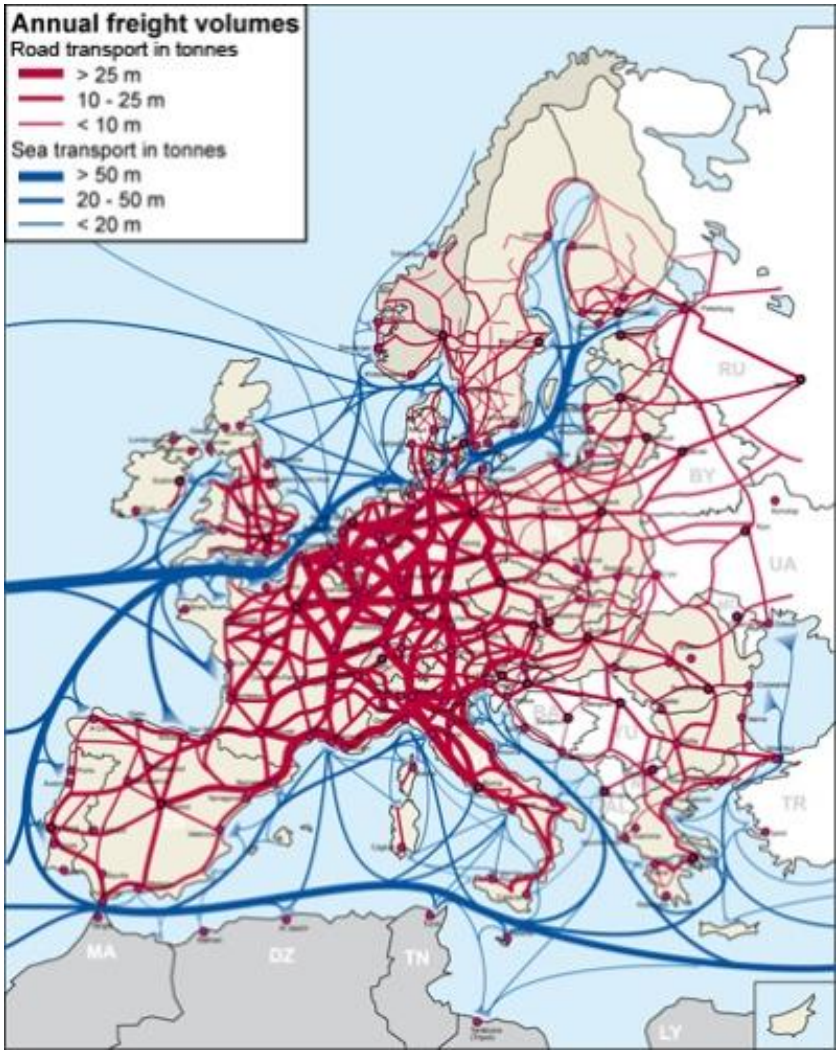
Source: Derived from European Commission, 2010

2.5 Best Practices: European Marine Policy

Policies in Europe have sought to actively promote marine as a means to reduce congestion, fuel consumption and emissions and as an alternative to road shipping. A blend of subsidies, taxation policy, and research and development has been involved. The marine mode certainly has achieved a great deal of prominence in Europe. With respect to the Nordic countries alone, the statistics are that they control 15% of the world fleet and 10% of the global market for shipping technology and equipment. This Nordic maritime cluster is estimated to employ 250,000 to 300,000 people directly (Marinova Consulting et al., 2009). Over the whole of Europe the numbers of course are even larger. Some indication of the prominence of marine in Europe can be seen in Figure 2.1 above where the combined modal share between ocean /sea marine and inland waterways as of 2008 is over 43%.

The success of the marine shipping industry in Europe is partly attributable to a geography of islands and many bodies of water that divide nations (see Figure 2.2). The greatest volume via marine is associated with the U.K., the trade of nations bordering the Baltic Sea, and in the Mediterranean Sea regions. With regard to the U.K., there is no real choice but to access the market via the marine mode. The Baltic and Mediterranean Seas offer direct trade routes that, unlike the GLSLS, are free of ice year round.

Figure 2-2: Annual European Freight Volumes by Road and Sea



Source: (BMT, 2011)

2.5.1 Long term, Integrated Transport Plans

One result of a long history of conflict and political fragmentation was that the European community resisted the implementation of a common transport policy until 1992. At that time, a Commission of European Communities White Paper on the development of a common transport policy advocated liberalization of the transportation market in Europe. Resulting policy changes caused a significant drop in consumer prices while the quality of these goods and services increased (Commission of the European

Communities, 2001). The report also provided a framework towards achieving an integrated, multi-modal network for shipping within the EU. In intervening years, congestion and emissions emerged as important issues.

As a result, the 2001 White Paper on European transport policy (Commission of the European Communities, 2001) focused on long term reductions in congestion and emissions by suggesting sixty specific measures to be taken at the Community level. The proposals made in this policy paper were guided by the following goals (Commission of the European Communities, 2001):

1. Revitalizing the railways
2. Improving quality in the road transport sector
3. Promoting transport by sea and inland waterway
4. Striking a balance between growth in air transport and the environment
5. Turning intermodality into reality
6. Building the trans-European transport network
7. Improving road safety
8. Adopting a policy on effective charging for transport
9. Recognizing the rights and obligations of users
10. Developing high quality urban transport
11. Putting research and technology at the service of clean, efficient transport
12. Managing the effects of globalization

Where the 2001 integrated transport policy focused generally on balancing modal shares in order to reduce congestion, the 2011 White Paper focuses on: reducing emissions by 60%, efficient multimodal inter-city transport, establishing a level playing field for the maritime and aviation sectors, and promoting cleaner urban transportation (European Commission, 2011b). To accomplish these goals the EC recommended the removal of all “residual” barriers between modes and national transportation systems, innovation and research sharing to promote the most promising technologies, financial support for multimodal links and the pricing of external transportation costs. To help provide a stable policy environment, these strategies are detailed to the year 2050 and involve all EU member states.

In its assessment of policy alternatives and the long term economic, social and environmental effects, the EC determined that full pricing of external costs of shipping was the best available policy option compared with the enactment of more stringent GHG emission standards. Pricing externalities would increase transportation costs for shippers in favour of sustainability (European Commission 2011c).

The EC has published its strategic goals for the marine sector to the year 2018 (Commission of the European Communities, 2009). The clear objective is to achieve and maintain a stable and predictable regulatory regime to strengthen the competitiveness of the European maritime sector in the hopes of contributing to the Lisbon Growth and Jobs Strategy (Commission of the European Communities 2009). The EC recognized that fragmented decision-making in maritime policy was not sufficient to the task of making European shipping competitive and sustainable (Commission of the European Communities, 2007). New demands on the maritime sector require a collaborative and integrated approach that reduces the confusion and inefficiencies of policy environments from different member nations that have evolved in separate and often contradictory ways.

Since the State Aid Guidelines (European Commission, 1997) there has been explicit recognition in the policy framework that marine is a special mode of transportation that requires policy efforts to maintain competitiveness with other modes. A framework for tonnage tax, income tax and state aid supports the maintenance and enhancement of marine shipping in Europe (European Commission, 1997). EU investments in ports and infrastructure, and a long term strategy for liberalization, ensure the right conditions exist for attracting private investment in marine. Integrated maritime surveillance, coastal planning and shared access to data and information from other EU states were identified as tools for integrated policy making by the EC (Commission of the European Communities 2007).

In contrast with the fragmented regulations on the GLSLS, liberalization of marine trade regulations is seen as a method to compete globally in international maritime trade. The EC has promoted the removal of duplicated customs procedures and other redundant administrative processes in addition to promoting the harmonization of documents to facilitate trade between EU states. EU cabotage regulations allow for domestic coastal shipping of one member state to be carried out by another member state. The purpose of this liberalization is to ensure that service is provided by the best available vessel without regards to the ownership, license and crew of the vessel. Most shippers in Europe charter rather than purchase vessels because they have access to a large vessel market. Charters for three to twelve months (CPCS Transcom Limited, 2009) are common therefore shippers have flexibility as to the capacity of the ships employed which permits rapid responses to changing economic conditions.

Overall, the EU policy efforts have been successful in maintaining marine's modal share. In 1995, the marine mode captured 41.5% of domestic and inter-EU tonne-kilometers. In 2008 this share was 40.3% Compare this result with the U.S. marine modal split reduction from 11% in 1995 to 8.1% in 2007 (European Commission, 2010).

2.5.2 Marco Polo and Motorways of the Sea

Transportation policy in Europe, given higher perceived external costs of trucking, is dictated by the desire to reduce truck travel in favour of rail and marine modes. To accomplish this goal, the EU instituted the Marco Polo program, which itself consists of five separate programs each aimed at shifting tonne-km off the road (Table 2.4).

Subsidies are awarded to firms with a plan to divert tonnage off of the road. The program is structured through an annual call for proposal (CFP) structure and is not specific to the marine sector. Each year there is a competition for a portion of the €450 million funding for the 2007-2013 period and it involves firms all around Europe. Between 2003 and 2009 a total of 125 projects, most of which were modal shift actions, have been funded by or in part by Marco Polo (European Commission, 2011a). Funding is partial to ensure that firms have a stake in the outcome and to maximize the chances that the project is aligned with market realities. See Figure 2.3 for a breakdown of 2010 proposals under the program.

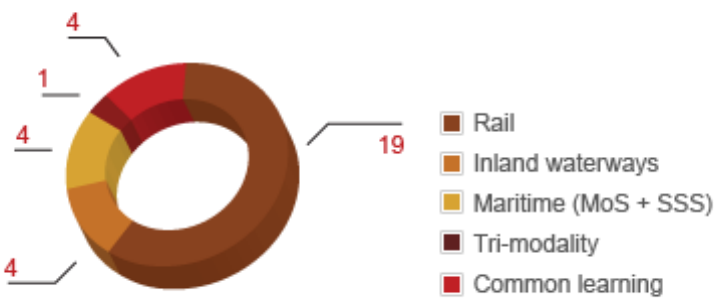
Table 2-4: Marco Polo Programs and Descriptions

A. Modal Shift (from road to a new or existing non-road service)	Aid allocated as subsidy per tonne-km removed from road; cargo-related with a modal shift threshold minimum and a cap on the percentage of costs subsidized and years of subsidy. Ancillary infrastructure investment not supported.
B. Motorways of the Sea (shift from road to short sea)	As for A. above but threshold minimum is half and years of subsidy may be longer. Includes ancillary infrastructure investment.
C. Removal of Structural Impediment	The supported action must not distort competition. Has cap on the percentage of costs subsidized by allows a longer subsidy period. The recipient of the aid is required to disseminate its results.
D. Disseminate Information on Learning	The amount of the subsidy is higher and the duration of the subsidy is shorter. Training is seen as a form of dissemination.
E. Restructuring of Production Logistics (so as to reduce road usage)	There is a subsidy to take tonne-kms out of the manufacturer's distribution network. Avoidance of road transport is the focus. There are minimum thresholds for traffic removal, and the subsidy rates are similar to A. Both ancillary infrastructure and preparatory measures are eligible; duration of subsidy is maximum length of other programs. There is a high traffic reduction threshold to meet.

Source: (CPCS Transcom Limited, 2008)

Motorways of the sea projects are part of the annual CFP process and are meant to shift cargo from the road to SSS or a combination of SSS with other modes. To compete, shipping companies must have a proposal to shift at least 1.25 billion tonne-km off the road at a maximum subsidy of €1 per five hundred tonne-km shifted. Each new project is eligible for a subsidy of up to 35% on the total cost of the project.

Figure 2-3: Proposals by Mode: Marco Polo Program (2010)



Source: (European Commission, 2011)

The EC report *A European Strategy for Marine and Maritime Research* (Commission of the European Communities, 2008) formally recognizes that marine research and development (R&D) and the sharing of this knowledge is the main competitive advantage that developed economies maintain in order to compete in the global maritime industry. To this end, a strategy has been adopted to better integrate the marine sector with maritime research by enhancing communication and improving interactions between the two (Commission of the European Communities, 2007).

One way that the EC is encouraging the development and sharing of knowledge is by requiring firms, which have been subsidized by Marco Polo, to disseminate the results of the project to marine firms throughout Europe. Future research and innovation will the aided by developing new R&D capacity, integrating maritime R&D sources, and creating synergies between member states. In this way the EC is striving to enhance Europe's competitive advantage over vessels sailing under flags of convenience (Commission of the European Communities, 2008).

2.5.3 Taxation

A principal objective of the State Aid Guidelines (European Commission, 1997) was to ensure that the EU states maintain a globally competitive marine sector. EU registered ships and crew are higher cost so the EC recognized the need for a competitive fiscal environment. For European shippers to compete with vessels registered under flags of convenience there had to be a requirement for essentially zero taxation on income. To this end, the EC endorsed a reduction in corporate taxation and wage-related liability.

The guideline suggested that the maritime corporate tax on profits be replaced by a tonnage tax. Firms' profits are ignored in favour of taxing the size of the fleet on an annual basis and at a predictable rate. The early adoption of the tonnage tax has stopped the flight of EU vessels to flags of convenience and immediately increased the number of EU registered vessels (Brooks and Hodgson, 2005).

2.5.4 Notes about European Rail Freight

Inland modes in Europe face vast distances, often congested roadways and mountainous terrain which reduce their ability to compete in trade between certain member states of the EU. Nevertheless, trucking has done very well with a modal share of 46% in 2008 (see Figure 2.1). Unlike the case in the GLSLS (see Chapter 3), Europe has a rail freight industry that has been in relative decline for decades. For 2008, only about 10% of intra-EU freight tonne-km were moved by rail (European Commission, 2008). In Canada, by contrast, rail handled 40% of national tonne-km (Transport Canada, 2011).

There are some parallels between EU regulatory restrictions relating to rail and the Seaway regulatory environment. Free trade between member states via rail came about in 2007 well after the free trade legislation for the trucking mode was enacted (European Commission, 2008). Until recently, rail suffered from a fragmented situation whereby each nation had developed its own customs procedures, infrastructure specifications and signaling systems. Border crossings would often require a different

train and/or crew. The most highly developed EU country in terms of rail freight is Germany, which offers a large population base and land mass to facilitate rail without border issues. To be sure, rail freight is a very capital intensive business and it is not hard to imagine that co-ordination between so many countries would be difficult to achieve. However, the regulatory environment has clearly played a role as well. In evaluating the relative success of the marine and road modes in Europe (both over 40% share of tonne-km) it is worth noting that they have addressed a void that rail has been unable to fill.

Seaway Regulatory Impacts in Context

The purpose of this chapter is to analyze the range of variables which have affected and continue to affect the Seaway marine mode and which also contribute to the selection of the road and rail modes. The focus is more on non-regulatory aspects with the reasoning that a complete picture is needed before informed assessments of regulatory impacts on the marine mode can be made.

The chapter begins with a general overview of the goods movement modes and provides some evidence of the volume of goods that these modes are moving within the region. A second section provides a higher level overview of the factors that shippers consider in choosing a mode. The rest of the chapter is divided into three sections which analyze choice dynamics and the variables that affect those choice dynamics. The first of these sections deals with a variety of cost variables, the second with quality of service variables and the third some exogenous variables which could alter the "playing field" over time.

3.1 An Industry Overview by Mode

Marine, rail and trucking in the local regional context are very distinct in terms of the characteristics of the industry and the firms that serve within each industry. In the Great Lakes context, marine is at best a slow growth industry and has actually declined significantly in terms of tonnages for reasons outlined

in Chapter 1. Few players are prominently engaged in the Canadian domestic movement of goods on the Seaway. As of 2006, the Canadian Shipowners' Association had seven members.

One of the largest of those players is Algoma Central Corporation which employs about 1500 people worldwide and at the time of writing had a market capitalization of about $450 million. The firm has three distinct transport segments: Domestic dry bulk, Product tankers and Ocean shipping. It is interesting to note that the domestic dry bulk segment, despite the Seaway winter closure, has by far the largest revenue of the three segments but the other segments, at least recently, have been much more profitable. While not a fast grower, the firm benefits from the stability provided by the long term service contracts it has with its clients.

Another large player on the Seaway is Canada Steamship Lines which operates domestically and internationally and employs about 500 people in Canada. The division that operates out of Montreal owns 11 self-unloading vessels and 8 bulk carriers which trade on the Seaway. The firm owns other vessels which operate around the world and which are foreign-flagged vessels. As such, the firm would not be required to pay tax in Canada on income earned in international operations.

Rail in Canada, apart from small shortline companies, operates as a duopoly with the participants being Canadian National Corporation (CN) and Canadian Pacific Corporation (CP). Both firms are much larger than the Seaway marine participants. CN for example, recently had annual revenues of $8.3 Billion and a net income of $2.1 Billion (a share of this was from U.S. operations). For the sake of comparison, CN's profits are about 4 times Algoma Central's revenues. The firm's market capitalization is approaching $35 Billion which is more than 75 times the market value of Algoma Central.

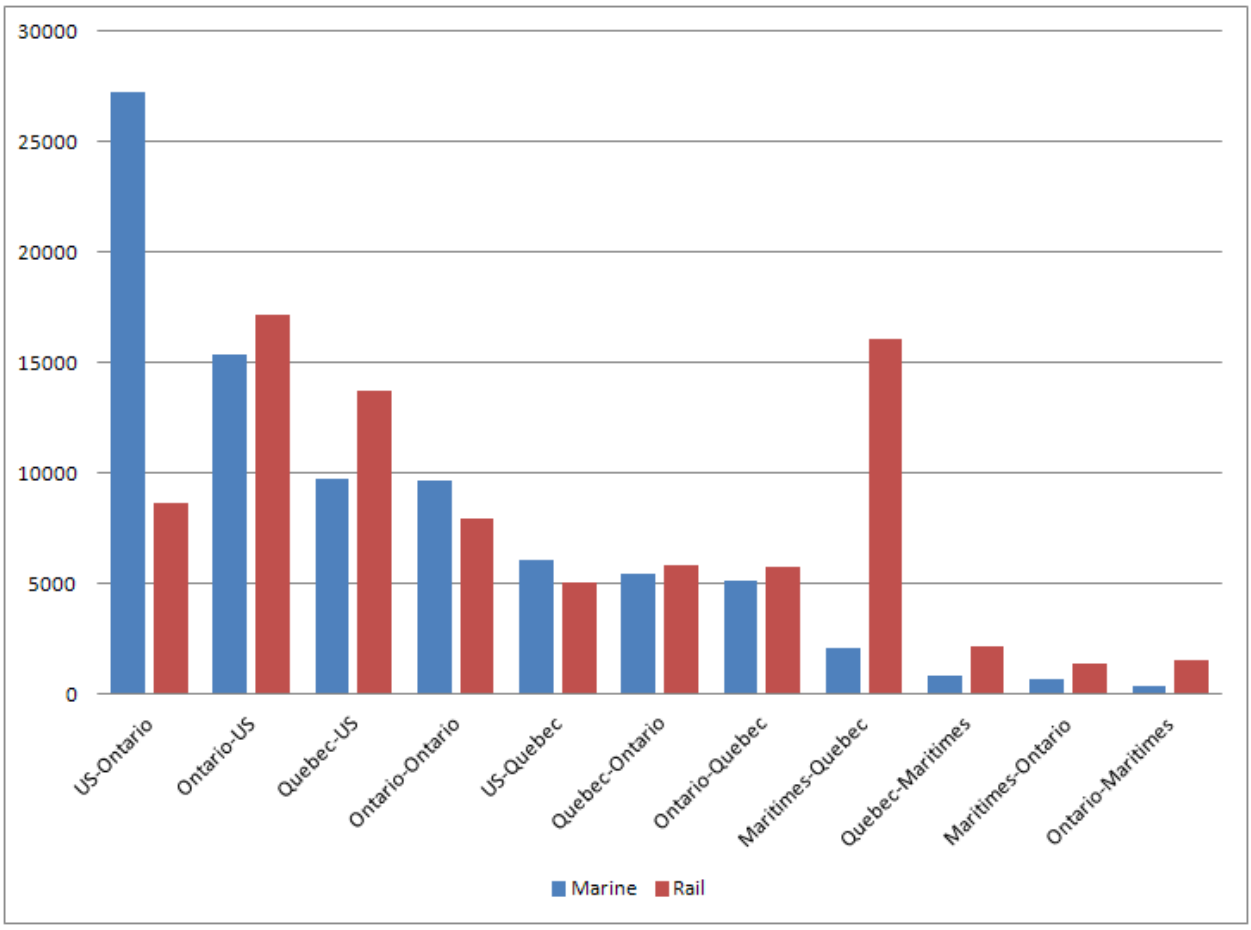
While marine and rail in the region are about large companies operating at a large scale, the trucking industry is much more fragmented and competitive with much lower barriers to entry. The trucking industry is the newest of the three and has experienced significant growth in recent decades. Interstate and freeway systems allow a single driver to travel easily about 800km in a typical day, which would have been impossible in the middle of the last century. Owner-operators and other non-unionized drivers are able to travel 150,000km or more per year (Bryan et al., 2007). Deregulation of the industry in Canada and the United States provided a tailwind also.

One other way to introduce and compare the modes operating in the region is to compare tonnages. Accordingly, Figure 3.1 is a good place to start. This graphic outlines interesting patterns with respect to marine and rail freight movements between key regional O-D pairings of relevance to the Seaway. The largest flow in terms of tonnage is the marine flow from the U.S. to Ontario. Bear in mind that these data are for 2004 and that marine coal flows to Ontario from the U.S. are now reduced due to changes in electrical generation policies and other flows have reduced in the wake of the Great Recession.

In terms of tonnage, the marine flows are very competitive with the rail flows. Additionally it has to be considered that the rail cargo is generally more diversified than the marine cargo and typically of higher value. A graph of container cargo between the same origin-destination pairings would show a very different picture. The Maritimes to Quebec flow is interesting in that the rail volume, at about 15 million tonnes, is very large. Mostly, this flow represents movements of iron ore which ultimately are destined

for the steel industry. One other note is that rail seems to dominate in general for flows involving the Maritimes. These results alone suggest that superior line-haul shipping economics, which marine benefits from, are not sufficient to explain the use of freight modes.

Figure 3-1: Marine and Rail Tonnages (in 000's) by Key Origin-Destination Pairings (2004)



Source: Derived from Provencher (2008)

By way of comparison, a 2003 custom tabulation (Marinova Consulting, 2005) suggests that the total for-hire trucking tonnage between Halifax and Southern Ontario is just under one million tonnes with the majority travelling eastbound to Halifax. Presumably the lack of balance in the two flows reflects that the higher value goods are flowing from the economic heartland by truck to the periphery. This additional data only seems to reinforce that rail is the dominant goods movement mode between Ontario and the Maritimes.

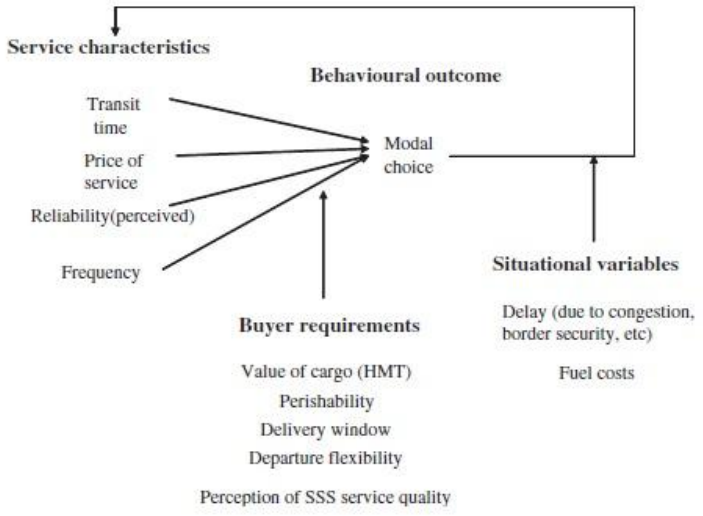
3.2 General Mode Selection Factors

Several elements contribute to mode selection. Speed, reliability, cost, frequency of service, and seasonality of service are all factors that shippers weigh when making a transport mode choice for

movements involving the GLSLS basin. Selection of the marine mode may be hindered by the perception that marine shipping on the Seaway is slower and less able to deal with just in time deliveries and tight delivery windows due to the slower speed of marine versus rail and truck (Brooks and Frost, 2006).

Research suggests that perceptions, in addition to logical measurements of time and cost savings, are important in understanding mode choice (Evers et al., 1996). Shippers can have an unobservable bias towards certain modes based on factors that cannot be captured in preference surveys (Bolis and Maggi, 2003). Figure 3.2 shows an example of a mode choice model that illustrates how mode characteristics, buyer requirements and perceptions interact to determine a modal choice.

Figure 3-2: Example of a Mode Choice Decision Structure



Source: (Brooks and Trifts, 2008)

Early studies on shipping mode choice (Saleh and Lalonde, 1972; Jerman et al.,1978; Brooks, 1985) found that aspects such as previous experience with a carrier and loyalty played a significant role in mode choice. Subsequent research (Brooks, 1995) placed an emphasis on service-oriented factors like transit time of goods. In a review of several research papers, Bryan et al. (2007) make the interesting observation that surveys of shippers versus carriers may differ in terms of findings. Shippers consistently state that good service and timely movement of goods is the number one priority. Carrier perceptions are that shippers are very focused on cost. Bryan et al. do not view the findings as inconsistent on the grounds that the carriers only deal with shippers after the shipper has determined that the carrier is likely to offer good service.

With respect to marine, Brooks and Trifts (2008) found the mode to be generally competitive after a certain distance threshold and that perceptions of reliability and frequency of service are important determining factors in modal choice. As marine has the greatest carrying capacity, the low departure frequency needed to deliver that capacity will imply that the market has a bias toward more frequent modes, other things being equal. Garcia-Menendez et al. (2004) investigated the factors significant in the selection of trucking versus short sea shipping (SSS) services in the European context. They found

that shippers' choice of SSS is sensitive more to changes in trucking prices and levels of service than to the same changes in SSS service.

Of the three modes, rail might be construed as being the "middle" mode as it incorporates aspects of the two other modes. Thinking of rail in this way provides insight into choice of freight mode. There are three primary types of rail service: intermodal, carload and unit train. Intermodal is the most oriented to higher value goods and is seamlessly integrated with truck. Intermodal is the most like trucking. Carload rail is the traditional rail business and is oriented more to the movement of bulk goods. However, the typical carload-oriented train will be carrying a diversity of carload goods and involves some fairly advanced logistics to assemble the trains.

The mode of train freight that is most like the Seaway marine mode is known as the unit train. Typically a unit train will be a regular service between two points where there will be multiple carloads of the same commodity and where the train will move in one direction loaded and will return to the origin empty. There are large unit train movements of coal in the U.S. out of the Powder River Basin in Montana/Wyoming. Locally, as an example, there are unit trains that move through the GTA and which take sulphuric acid from the mining regions of Northern Ontario to the United States. The key similarities between unit trains and Seaway bulk goods movement is the lower value per unit of the cargo and the uniformity of the cargo within a given single movement. One caveat to the comparison with unit trains is that self-unloading marine vessels, which are prominent in the Canadian fleet, are fairly dynamic in their ability to serve multiple ports and deliver different amounts at each stop.

3.3 Cost Variables

3.3.1 Costs to Achieve Economies of Scale

While it is not strictly correct to list scale economies as a "cost" as are other aspects in this sub-section, rail and marine are very dependent on incurring the necessary costs to move large amounts of freight on a given movement. Ultimately, the concept is of central importance in reducing associated line-haul costs for these modes in particular.

In the case of the containerized marine mode on the Seaway, it is ironic that marine scale economies are a significant explanation for Seaway under-utilization. Containerization did not really gain traction until the mid-1960's when ports began to invest in the necessary infrastructure to handle containers (Marinova Consulting, 2005). Since then, as outlined in Chapter 1, there has been no looking back as container ships have been realizing greater and greater scale economies by getting bigger and bigger. Container service was offered in the Seaway in the early days but completely fell by the wayside as ships got too large to go further upstream than Montreal. By 1990, less than 30,000 tonnes of containers made it as far as Lake Ontario versus 5.5 Million tonnes that were serviced in Montreal (Marinova Consulting et al., 2009).

Potential new container services have been proposed in recent years and while associated vessels would be nowhere near as large as international container ships, scale would still be an important element in success. Larger vessels offer better per-unit or per-tonne costs. Capital costs, crew costs and fuel costs

increase at a slower rate than capacity as it gets bigger. A certain size needs to be achieved in order to overcome the fixed costs associated with these cost elements. Larger vessels have better speed because of longer waterlines. These greater speeds would be needed to make a regular container service work, however, as larger vessels would be associated with more loading and unloading time (Marinova Consulting, 2005).

In the rail context, there are heavy fixed costs associated with aspects such as crew, power and marshalling which induces the need for large trains. Typically, multiple train cars will move under a single bill from one shipper. Blocks of cars can derive from multiple shippers utilizing a single origin-destination pairing. Railroad logistics parks exist to concentrate various trucking to rail functions (transloading) at single locations to build up car blocks of carload cargo. Rail intermodal terminals do the same thing for containerized cargo. Bryan et al. (2007) note that these functions have similarities to the consolidation of road freight at an intercity terminal so that less-than-truckload shipments can move efficiently. Overall, through car blocks and aggregations of cargo from different shippers, rail is capable of moving very substantial amounts of cargo but there is a great deal of flexibility and modularity in how the train gets assembled. In the case of containerized service, the rise of double stack intermodal cars has had a profound effect on the ability to achieve scale economies and are estimated to have cut line-haul costs nearly in half (Bryan et al., 2007).

Trucking is often referred to as a business not subject to scale economies since it is not dependent on accumulating the massive loads of marine and rail. However, Bryan et al. (2007) object to this portrayal noting that in the U.S. context, the rise of large trucking firms such as J.B. Hunt and Schneider National was very much related to operating on a large scale. These efficiencies were not so much linked to the size of the typical load but many other benefits from operating at a large scale. In the Canadian context, it has been noted that some of the larger, better managed firms can thrive with margins as low as 2.5 to 5% of revenues (Transport Canada, 2005). Larger scale is almost a necessity to survive under such tight margins.

The best way to sum up this section on scale economies is with some quantitative results. In their analysis of short-sea shipping scenarios between Halifax and Hamilton, Marinova Consulting (2005) has found that the total scale of operation would require expenditures of over $300,000 per direction to develop a containerized service with even a theoretical chance of making a profit. In contrast, Transport Canada (2007) and consultants have estimated a cost per train of between $88,000 and $94,000 to move a comparable double-stacked trainload of containers between Halifax and Toronto, which they claim works out to between 1.1 and 1.2 cents per tonne-km. In terms of massive movements of bulk commodities, in contrast, the scale economics for marine are relatively much more favourable.

3.3.2 Logistics and Inventory Costs

In contrast with the rise of lean inventories and highly efficient, just-in-time supply chains, there is more leeway in the movements of many bulk commodities. The Seaway winter closure is a profound obstacle in the context of many supply chains but in the case of iron ore and coal, inventories simply are built in late summer in preparation for the winter (Marinova Consulting et al., 2009). With goods that are of

lower value on a per unit basis, such a strategy is acceptable. With higher value goods, similar thinking would be disastrous and is the main reason that any sort of containerized Seaway marine service would need to have a winter workaround. For raw materials, the importance of factors such as the value of time, frequency and reliability is less than is the case with food, semi-finished, and finished products (Transportation Economics and Management Systems Inc. and RAND Corportation, 2007).

Another marine benefit with respect to bulk commodities is that in many cases, the end-customer can be reached directly without any reliance on other modes. For most customers, especially in the non-bulk context, the customers are inaccessible to the marine mode. By the same token, a reliance on trucking and the need to switch modes is one of the main reasons that rail is not competitive with trucking over short distances.

Transport Canada (2005) has compared trucking with intermodal rail over a variety of scenarios and has discovered that the time value of goods is an important determinant of the chosen mode. With rail there is a much higher probability of substantial delay caused by a shipment just missing the train. Accordingly, for a shipment along the Montreal-Toronto corridor, it is found that the costs associated with the time value of goods are minimal whereas by rail it amounts to approximately $300 per container and a significant proportion of the overall shipment cost (assuming an average shipment value of $75,000). In comparison, for a shipment between Vancouver and Toronto, the time value costs by rail are estimated as $1325 whereas for truck it is $784. The big difference though is the overwhelming line-haul costs associated with trucking over such long distances which far out-weigh the time value costs. Over shorter distances, time value savings are critical in the frequent choice of the truck mode.

Needless to say, if it is hard for rail to compete over shorter distances due to the time value of goods, than it will be doubly hard for the marine mode in the Seaway region. One exception is the possibility of a service where marine is complementing trucking rather than competing with it. If marine can offer trucks a shorter distance (e.g. across Lake Erie) then there is the possibility of time savings but such a service will suffer from connection risks as in the rail context.

3.3.3 Line-haul costs

It is instructive to compare the freight modes in terms of overall line-haul costs where marine is always noted to have a significant advantage. For the marine and rail modes, the overall results of such comparisons are very much dependent on achieved scale economies. In a scenario with a laker carrying 26,000 tonnes an estimate of $0.0046 per tonne-mile ($0.0028 per tonne-km) is derived which equates to about $150 per vessel mile in the given scenario (Marinova Consulting et al., 2009).

Forkenbrock (2001) estimated a cost for 1994 trucking in the United States of 8.42 cents per ton-mile or 5.76 cents per tonne-km which worked out to an operating cost per km of 78 cents. A more recent study by Transport Canada (2005) indicated that costs had increased quite a bit in the intervening decade and were also a function of the annual mileage driven. For long-haul trucking, costs as low as $1.39 per km were estimated. More generally, a standard five axle truck with trailer was estimated at $1.81 per km assuming 80,000 km mileage per year and $1.51 per km at 240,000 km mileage per year.

The results for a straight truck (i.e. no trailer) used in an urban setting work out to as high as $3.40 per km for a truck that does not do a lot of mileage.

For rail, the cheapest line-haul costs are experienced in the context of double stack intermodal movements. Forkenbrock (2001) estimates rates per tonne-km as lows as 0.73 cents. Nowadays, a more appropriate estimate that takes carload traffic into account as well is in the neighbourhood of 2-3 cents per tonne-km depending on context. Overall, the discussion in this section indicates that there is a lot more to freight mode selection than line-haul costs since trucking appears rather uncompetitive on this basis and marine seems very attractive. Other sections will outline the factors which counteract the effects of line-haul costs.

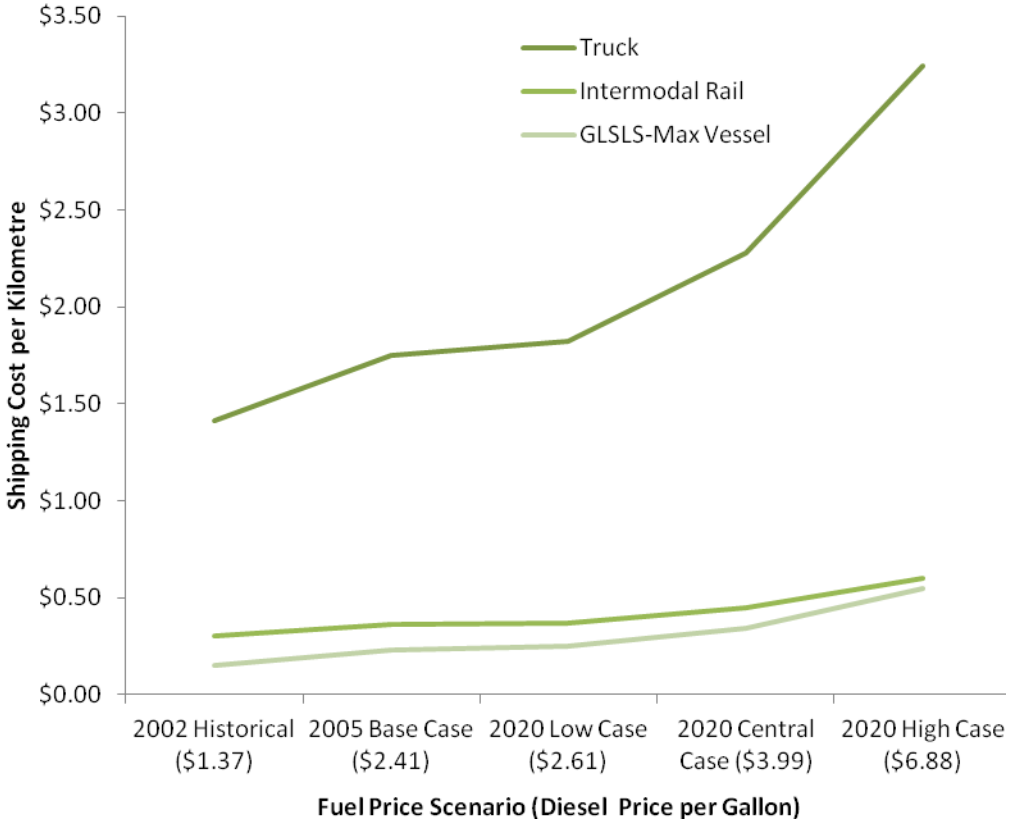
3.3.4 Fuel Costs

A significant cost component for any of the modes is fuel. For marine the two main fuels are Intermediate Fuel Oil (IFO) and Marine Diesel Oil (MDO), which are more popularly referred to as bunker fuel. The former is used for propulsion of the vessel and the latter is used for onboard generation. At the time of writing, IFO is being quoted in the vicinity of $730 per tonne and MDO at approximately $1000 per tonne. These figures are about double the levels assumed in the Marinova (2005) short-sea shipping study. Over the course of a one-way trip between Halifax and Hamilton the fuel usage was, depending on the scenario, estimated as 15 tonnes of IFO and 2 tonnes of MDO. Translated to dollars, the costs at the time were generally between $30,000 and $35,000. Presumably, fuel costs in the interim for similar scenarios have gone up substantially which would damage the likelihood for profitability.

In 2010, the rail companies in Canada used just over 2 billion litres of fuel which translated into 182 revenue tonne-km per litre of fuel (Railway Association of Canada, 2012). In a sample scenario (Transport Canada, 2007, p. 19), fuel costs made up 14.5% of the total costs of running a train or in the vicinity of $24,000 for the particular scenario. For trucking, diesel fuel costs were estimated to make up 18 to 24% of operating costs for long-haul movements and in the vicinity of 10% for urban trucking (Transport Canada, 2005). The reason for the difference is that urban trucking by its nature is much more associated with stops, sometimes of long duration, whereas long distance trucking is more a continuous movement.

One topic of interest with respect to fuel costs is the question of what happens if prices increase dramatically. Transportation Economics and Management Systems (2008) estimated that as oil prices increase, marine becomes more competitive from a cost per ton perspective. TEMS calculated the shipping cost per container for different oil price scenarios and set a base case price per barrel of oil at $54.79. Figure 3.3 shows that both intermodal rail and a Seaway-Max vessel are far less sensitive to fuel price increases than the trucking mode. The latter would see an 85% increase in shipping cost per kilometer in the most pessimistic scenario with the cost of oil at $157.18 per barrel by 2020. Overall, the competitiveness of the GLSLS would increase although not by much relative to rail.

Figure 3-3: Line Haul Cost by Fuel Price Scenario and Mode



Source: (Transportation Economics and Management Systems Inc., 2008)

An important implication of the more extreme price increases would be that trucking would certainly be used less over longer distances. In the intra-urban context, there are no viable alternatives to trucking though. With respect to the GLSLS, it is noted that the higher fuel increase scenarios might also damage the case for shorter to medium length truck hauls to the point that some marine options would become much more attractive (Transportation Economics and Management Systems, 2008). In particular, it is noted that container-on-barge services would be the least affected by high fuel prices and might become competitive to trucking in some shorter-haul contexts. Barges would be hurt relatively less by fuel price increases than more sophisticated Seaway-oriented vessels. In addition, it is noted that various cross-border rail services in the GLSLS region are more long-distance oriented and do not do a very good job of serving cross-border short hauls.

3.3.5 Vessel Costs

In the marine context, a vessel purchase is a very large one. Even a vessel of minimal size (e.g. 200-400 TEU) to support a short-sea shipping service would be in the range of $18 million. It is not surprising that marine shipping companies around the world seek to charter (i.e. rent) rather than own vessels and thus free themselves to concentrate on the core business of shipping goods. Whether based on a charter or a financing of a vessel purchase (perhaps 2nd hand), the acquisition of a vessel to develop a

new service is a fairly large barrier to entry for many entrepreneurs who would contemplate the idea of moving goods by marine perhaps in the context of a Seaway feeder service. Further regulatory barriers are enforced in Canada in the form of unique hull construction regulations that are not in place anywhere else (Marinova Consulting et al., 2009). A vessel brought to Canada must then be reconfigured, which then makes an international sale of the vessel almost impossible. These are all possible reasons that there are only five Canadian registered short-sea shipping vessels in Canada (Marinova Consulting et al., 2009).

Rail is a capital intensive business as well but in terms of the "vessel" in the form of diesel locomotives and rail cars, the expenditures are much more modular in nature. Anecdotally, it has been learned that the price of a new DC diesel locomotive is in the range of $2 million and rail cars are a fraction of that amount. In the trucking context, a new tractor ranges anywhere from $85,000 to $130,000 and a new trailer, depending on its characteristics can cost from $30,000 to $180,000 (Transport Canada, 2005). Some carriers do not own tractors and instead hire owner-operators to move their cargo. The carrier assumes responsibility for aspects such as marketing, operations management, accounting and other admin services as well as providing the trailer with cargo. Such an approach permits flexibility in fleet capacity and in the ability to respond to short term fluctuations in the market, among other advantages. This example is mentioned to illustrate a level of flexibility in the trucking industry that is difficult to match in a marine context.

3.3.6 Handling Costs

In the marine context a certain scale is required for an operation to have profit potential and it is this very scale which makes handling costs a significant expense and also a consumer of large blocks of time. For a container service between Halifax and Hamilton lift costs were estimated as $175 per container in regular time and $200 on weekends and evenings. Also, there would be port costs of between $200 and $225 per container. Within a given hour, the expectation might be for 50 lifts per hour if two cranes were involved. At Hamilton, a stevedoring company indicated lift costs of $135 per lift and with port costs of $175 charge per container (Marinova Consulting, 2005). The degree to which these variable costs add up of course depends on the size of a vessel. In general, numerous differing scenarios indicated that the expected costs for handling might range from $120,000 to $180,000. In either case, these figures represent a very substantial percentage of the overall cost of the service.

Handling costs for rail appear to be more reasonable. Bryan et al. (2007) indicate that intermodal lifts work out to between $2.00 and $2.50 per short ton. Assuming an average weight per container of say 10 short tons, it is evident that the process of getting containers on and off a railcar is much cheaper than getting containers on and off a marine vessel. In the context of bulkier rail carload goods, the costs for loading/unloading are in the range of between $5 and $6 per tonne. Handling costs with respect to the trucking mode, in comparison, are assumed to be minimal.

3.3.7 Crew Costs

Using a shipment scenario from Halifax to Hamilton (Marinova Consulting Ltd., 2005), Table 3.1 offers a comparison of the modes largely geared toward labour requirements per unit of cargo. The truck mode

is the most labour intensive mode in that 1,000 man-days would be needed per 1000 TEU whereas rail achieves a very efficient result. In terms of capacity, it is worth noting that the Dutch Runner, a container vessel brought into Canada by Great Lakes Feeder Lines to offer service in the region is able to carry 221 TEU so there are possibilities of smaller vessels that potentially could be less efficient in terms of manning per TEU.

Table 3-1: Modal Efficiency for Halifax to Hamilton Shipping

Mode	Capacity (TEUs)	Speed (km/h)	Transit Time (days)	Manning	Man-days per 1,000 TEU
Truck	2	50	1.5	1	1,000
Rail	250	45	2	4	32
Water (Large)	1,000	19	8	21	168
Water (Small)	400	12	8	10	200

Source: Marinova Consulting, 2005

3.3.8 Pilotage Costs

The concept of pilotage is unique to marine and is a quite costly disadvantage relative to other modes. In the trucking and rail contexts, there are not unique segments of the journey where a local expert takes over temporary control of the vehicle to maneuver through that segment. In the context of a marine container service between Halifax and Hamilton, the Laurentian Pilotage Authority fees were estimated to be in the order of $14,000 per direction (Marinova Consulting, 2005). As well, there was an estimated $600 in pilotage fees at the Port of Halifax. No pilotage fees were assumed under the Great Lakes Pilotage Authority on the basis that pilotage is not enforced in that region for domestic crews with sufficient local experience in lock transits.

3.4 Quality of Service Variables

3.4.1 Year Round Operation

The issue of the Seaway not having year-round operation is a big one and perhaps one of the main reasons that comparisons to generally milder European experiences are not "apples to apples." The fact that the Seaway is not navigable for a large portion of the year has always been an obstacle for shippers and has been a factor in a preference for other modes. Historically, the Seaway was able to stay open for eight and a half months per year, or about 255 days (McCalla, 1994). Due to climate change the Seaway has recently been able to operate for around 280 days (The St. Lawrence Seaway Management Corporation and Saint Lawrence Seaway Development Corporation, 2010). The 2011 season was a record 284 days.

One key point is that marginal improvements in the length of the Seaway season are very likely to be inconsequential in changing the perceptions of shippers (Marinova Consulting et al., 2009). A mode is either available year-round or it is not. Other modes of transport have their issues in winter transit as well. In the case of trucking, for example, there are estimates that winter-only trucking is associated with a 20% climb in fuel consumption, a 30% increase in per km tire costs and a 20% increase in per km

repair costs (Transport Canada, 2005). Such issues are problematic for non-marine modes, but the impact is minor compared to a mode closure of months duration.

There are several unfavourable implications of the winter closure. For those shippers who might consider using rail only in the winter months, there is the reality that less favourable rates would be negotiated with the rail carriers than for those shippers purchasing year-round service. The largest shippers pay the lowest rail rates. In the context of container movements, it is estimated to cost an extra $442 per container to transship from marine at Montreal and then truck to the GTA (Marinova Consulting, 2005). The use of a winter Seaway bypass from Halifax to Hamilton via Albany, N.Y. and Oswego, N.Y. is estimated to cost an extra $600 per container (Marinova Consulting, 2005). In terms of vessel ownership, there is the reality that marine shippers must spread the very substantial fixed costs of ownership over shorter annual time periods when the vessels can operate.

Despite the damaging repercussions of the annual Seaway closure, year-round navigation is not considered possible due to constraints with the system of locks (Marinova Consulting et al., 2009). In general, ice build ups cause problems with lock operations and can affect the vessels also. The locks themselves are costly to maintain and require detailed annual inspections. In 1985, a large section of Lock 7 at the Welland Canal collapsed and caused a lengthy shutdown of vessel traffic. The annual inspections seek to prevent such incidents.

3.4.2 Range of Locations Served

An important advantage of the truck mode is that it can get to and from virtually anywhere in a city or between cities. To the extent that rail and/or marine are competitive in this regard, they need to rely on trucks. Rail networks were largely constructed in the 19th century before trucks offered competition. These networks were dense and central-city oriented and served numerous industrial sidings and port facilities (Bryan et al., 2007) without any dependence on trucks. The rail industry has spent a large part of the 20th century rationalizing networks in response to the rise of trucking and in the process serves far fewer locations directly but has become far more efficient. For carload goods, rail has become very dependent on its transloading facilities where a variety of loading/unloading technologies are used to transfer cargo between rail cars and trucks. In this context, trucks serve the actual origins and destinations of shipments. In the containerized context, containers are directly loaded onto trucks to reach the end-point of the trip.

To the best of our knowledge, marine ports in the study region in general are not as well connected to the trucking mode as is rail. There are some exceptions such as the recent partnership between the Port of Hamilton and the trucking firm Fluke Transport. However, the locus of trucking/warehouse activity has suburbanized in recent decades away from central city ports in many cases. For example, the main intermodal rail terminals located in the Toronto Metropolitan area (CN Brampton and CP Vaughan) are very suburbanized and large networks of logistics facilities have formed in the vicinity of these terminals and Pearson Airport. The effect has been to take the marine mode out of the conversation in many shipping contexts.

One other dimension to the matter of the range of locations served is that rail has a very extensive network. Rail may not directly serve as many locations in a given metropolitan region as in decades past but the rail networks have a continental reach that is conducive to meeting more shipper needs. The CN network, for example, links the coasts east-west and provides direct linkages as far south as the Gulf of Mexico. Fewer direct network effects are possible in the Seaway marine context as it relates to the North American mainland; although the direct international reach of the Seaway is superior to rail.

3.4.3 Timeliness

While marine has the lowest line-haul costs of any of the modes, there are clearly other important considerations that come into play. The Great Lakes and Seaway involves a number of short distance routes where time in port is important, flexibility is required and relatively small amounts might be getting delivered over multiple stops (Marinova Consulting et al., 2009). Accordingly, Canada Steamship Lines for example, has developed as the world leader in self-unloading vessels. This family of vessel, which permits maximum flexibility, is an important competitive advantage. Cargo exits via gravity onto a conveyer system that will run the length of the vessel. Self-unloaders are heavier vessels though and they actually increase line haul costs by 10-20% (Marinova Consulting et al., 2009). In other words, leading marine operators recognize the prudence of trading off the key marine line-haul advantage to gain in flexibility and improve the level of timeliness. Consider that the new Algobay, a recently introduced vessel, can unload 38,000 tonnes of cargo at a rate of 5,000 tonnes per hour. On the downside, the rise of the self-unloader has left many Great Lakes ports with inadequate infrastructure.

The self-unloader is a technologically advanced way of dealing efficiently with large amounts of bulk cargo and not being too dependent on port infrastructure to do it. Bulk cargos that can benefit from the automated loading/unloading capabilities of such vessels can have much smaller breakeven distances in the marine context than many types of manufactured cargoes (Marinova Consulting, 2005). The Seaway marine mode has historically struggled with respect to non-bulk, semi-manufactured or finished products (with the exception of project or dimension cargo) (Marinova Consulting et al., 2009). It is with these higher value types of cargo, that are not so imposing to move in terms of sheer quantity and which are more intimately connected with finely tuned supply chains, that the rail and truck modes have a lot of success.

Few would argue that trucking provides the best service for most movements and that the secret of intermodal rail, for example, is that it combines something approaching the service of trucking with the economics of rail. In terms of timeliness, there are actually few routes within North America where trucking is not competitive even over fairly long distances. For example, it has been estimated that a long-distance trucking trip from Toronto to Vancouver can be completed within 57 hours by a single driver obeying the appropriate hours of service regulations (Transport Canada, 2005) and in even less time if a team of drivers is employed. In contrast, it is estimated in the same study that a rail intermodal service between the same two endpoints could take as little as 48 hours and as much as 81 hours. It is not on the basis of duration that the superiority of intermodal for this trip has generally been established. Trucking will generally take less time over that distance and with less variability in arrival

time so for a sufficiently valuable cargo it may well be the preferred choice. In the context of the much shorter Toronto-Montreal corridor, trucking is even more competitive.

3.5 Exogenous Variables

Clearly, one of the more important exogenous variables which can have a big impact on Seaway marine movements is the regulatory environment. The threat of strict new ballast water regulations from New York State that cannot be met by existing vessels is an example of a potential exogenous threat. The purpose of this section though is to consider potential impacts of other exogenous variables.

3.5.1 External Costs

The total cost of shipping cargo can be divided up into three categories on the basis of who pays (United States Government Accountability Office, 2011). In general, private costs such as: fuel, labour, vehicle purchase and maintenance are borne by the shipper. Public costs like: pavement/road construction or maintenance, lock construction maintenance, and providing inspection services are, with some exceptions, passed on to the government. Finally, external costs caused by pollution, congestion, accidents and environmental degradation are borne largely by society-at-large. This theme is seen as an exogenous variable in the sense that some large change in sentiment could cause a much larger movement toward marine as part of a solution which addresses environmental impacts.

For now though, there is probably a general consensus that the impacts of external costs are not high on the list of factors that shippers consider when they are making a freight mode choice. Bryan et al. (2007) suggest that the effects of shipping decisions on congestion, air quality and other aspects are usually not considered. In the marine context, Marinova Consulting (2005), is of the opinion that any new marine service serving the Seaway would likely not benefit from environmental concern as a major tailwind for the initiative.

For the marine mode, the fact is that ballast water discharges have introduced invasive species into the Great Lakes and that this outcome imposes a cost on society that is not reflected in the rates paid by shippers. But other modes have imposed external costs also. The United States Government Accountability Office determined that there is $55,000 worth of external costs for trucking (per million ton-miles of service) that are not directly passed onto consumers. This compares with $9,000 and $6,000 worth of external costs for the rail and marine modes respectively (United States Government Accountability Office, 2011). Once again, rail is a close competitor to the marine mode, especially relative to trucking. The quoted numbers for marine do not appear to include an amount for invasive species. Forkenbrock (2001) reinforces these results for truck and rail having derived external cost estimates of 0.86 cents per ton-mile for the former and 0.25 cents per ton-mile for the latter. In general, most of the external costs for all the modes relate to emissions and their impact on society.

Table 3-2: Relative External Costs by Mode

Mode	Fuel Consumption	Emissions	Accidents	Spills
Truck	9.7	7.6	74.7	37.5
Rail	2.2	1.4	13.7	10
Marine	1	1	1	1

Source: SODES, Etude comparative des impacts environmentaux des modes de transport dans l'axe du Saint Laurent

With the caveat that a comprehensive calculation of external costs is a very complex undertaking, Table 3.2 provides a useful overview of the relative external impacts by mode while Transport Canada (2008) has provided estimates of social costs across the modes in dollar terms as seen in Table 3.3. With regard to this latter table, it is noted in the original report that the figures represent mid-points in the range of possible estimates, which does imply that are some inherent uncertainties in the estimates.

Table 3-3: Social Cost Estimates by Major Mode (in billions of 2000 $)

Mode	Accidents	Delay	Air pollution	GHG	Noise	Total
Road	15.78	5.17	4.73	3.68	0.22	29.59
Rail	0.30	Not covered	0.44	0.19	0.00[1]	0.93
Marine	0.06	Not covered	0.54	0.24	Not covered	0.84
Air	0.10	Not covered	0.03	0.47	0.03	0.64
Total	**16.24**	**5.17**	**5.74**	**4.58**	**0.26**	**32.00**

Source: Reproduced from Transport Canada (2008). Estimates of the Full Cost of Transportation in Canada

Fuel consumption has been discussed to some degree in Section 3.3.4 under fuel costs but suffice it to say that trucking is by far the most energy intensive of the modes. Air emissions can be classified into four groups: criteria air contaminants (e.g. carbon monoxide, nitrogen oxides, particulate matter), heavy metals (eg. lead, cadmium, mercury), persistent organic pollutants (e.g. dioxins, furans, benzo pyrene), and greenhouse gases (e.g. carbon dioxide, methane, nitrous oxide) (Genivar, 2008).

With respect to spills of hazardous materials, marine has by far the lowest frequency of events. On a gallons spilled per tonne-mile basis, rail and marine are actually quite similar (Transport Canada, 2007). In terms of severity per spill, the ranking of the modes is reversed. When they do happen, marine spills are extremely serious events.

3.5.2 New Technology

An important exogenous force is the development of new technologies which is taking place across all modes of freight transport. For the rail and road modes, new developments have greatly increased

efficiency while reducing the environmental foot print. As there are developments across all the modes, it is possible that new technologies would not force any drastic changes in the modal choices that are being made.

With respect to the marine mode, new ship technology will make it possible to handle freight on the GLSLS more efficiently. The recent removal of the 25% import tariff on new vessels to Canada makes these new vessel technologies more accessible to Canadian shipping companies. New technology allows for GLSLS dimensioned vessels to consume 40% less fuel than the fleet currently in operation (Pung, 2011a) and to carry up to 1,300 TEUs of cargo (Transportation Economics and Management Systems Inc. and RAND Corportation, 2007).

Fast new combination roll-on/roll-off (Ro/Ro) and bulk “fast ferry” vessels fit within the Seaway maximum dimensions, and would be able to transit the system 36% faster than a Seaway-Max vessel. These fast ferries can carry 60 TEUs and travel at speeds up to of 63.9 km/hour. Speeds are enhanced by the ability to operate in a "non-displacement" mode (Transportation Economics and Management Systems Inc. and RAND Corportation, 2007).

The new Partial Air-Cushion Support Catamaran (PACSCAT) is a long slender vessel successfully operating in European waterways. The PACSCAT is built below Seaway-Max dimensions and is able to carry up to 210 TEUs up to 37 km/hour. The vessel is partially supported by lift fans which raise the vessel higher in the water. This innovation permits reduced resistance and fuel consumption, increased speed, and a shallower draft (Transportation Economics and Management Systems Inc. and RAND Corportation, 2007).

There are new technologies in development and early application which enable more efficient and safe lock transits. Hands Free Mooring is a new technology which braces a ship during a lock transit and to a large extent replaces manual line handling which can be dangerous. There are also new lock navigation technologies within locks which allow vessels to carry the maximum possible loads.

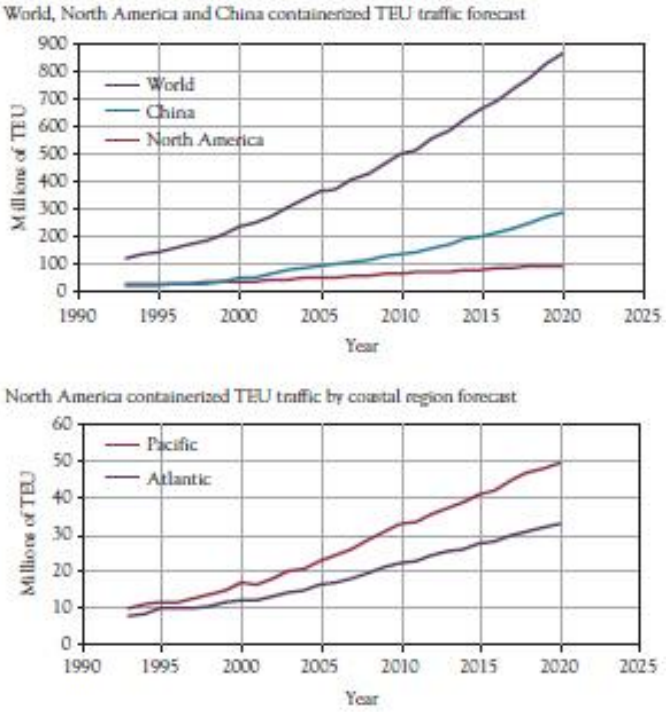
3.5.3 New Container Traffic

One potential exogenous variable that may spark new developments on the Seaway is the current Panama Canal expansion. When the original Panama Canal was completed in 1914, its 4,400 TEU container vessel capacity and 12 metre draft were far in excess of requirements at the time. Since then “Post-Panamax” vessels, larger than what the Canal can accommodate, have come to represent 33% of the global fleet (Rodrigue et al., 2009). By 2015, improvements to the Canal will allow for 2,000 more ships to transit per year at a maximum capacity of 12,000 TEU and at a draft of 15.2 metres.

The ability to handle larger vessels will make it more cost effective to ship cargo to the East Coast of North America and potentially carry it inland as far as Chicago. At present, it is typically more cost effective to ship goods to the West Coast where it travels inland a far greater distance (Rodrigue et al., 2009). Of the two ports that can transship to regional vessels suited to the GLSLS, Halifax is better positioned to allow vessels with up to 15.2 metre draft. Montreal may lose international volume, and as

a result shipments from Halifax may rely more on the GLSLS to carry goods upstream. Naturally, rail as well as marine may stand to benefit from these developments also.

Figure 3-4: World Growth in Container Traffic to 2020



Source: Transport Canada et al., 2007

In Europe, where there has been success in maintaining hub and spoke and SSS marine services, the average size of the regional vessels is 620 TEUs (CPCS Transcom Limited, 2008), which is well within the capacity limits of the GLSLS. By 2050, it was projected that under congested road conditions, the Seaway could capture 4.5% of the container traffic modal share from the GLSLS basin (Transportation Economics and Management Systems Inc. and RAND Corportation, 2007). This share would imply 157,000 annual TEUs of new container traffic or the equivalent of 250 one way transits on vessels meeting the typical European regional vessel size.

It is also worth briefly describing the global picture and recent history with respect to container traffic. Increasing global trade has seen a matching increase in container traffic. China alone accounts for 30% of the 560 million TEUs shipped worldwide in 2010 (World Trade Organization, 2010). Container TEUs are forecast to approach 900 million by 2020 Figure 3.4. In North America, traffic is expected to grow on the East Coast at a slightly slower pace than on the Pacific Coast and will account for 37% of North American container traffic by 2020 (Transport Canada et al., 2007). It is important to note that the past twenty years in particular have been a time of massive growth in world container traffic and yet the amounts passing through the Seaway have dwindled to near zero. It is a valid question to ask whether similar rises in the future induced by the Panama Canal changes will translate into increased Seaway container traffic.

3.5.4 Congestion

Congestion of road and rail routes that use road and rail modes has been experienced in the heavily urbanized portions of the GLSLS and could get worse (Transportation Economics and Management Systems Inc. and RAND Corportation, 2007). The competitiveness of these modes is being challenged by the slower speeds and higher fuel consumption that congestion causes. A projected 2.5 times more traffic demand on existing rail and road corridors (Transport Canada et al., 2007) is expected in coming decades.

For freight carried on the trucking mode, the problem of highway capacity is not so much a lack of capacity but rather that trucks must compete with the automobile for highway supply. Congestion problems are generally found in and around urban centres and during peak times where the volume of automobiles that demand highway supply is greatest. The worst Canadian congestion in the GLSLS basin is found in the major metropolitan centres of Toronto and Montreal. Meanwhile, the Federal Highway Administration has forecasted that peak-period road congestion is soon going to exceed the capacity of the national highway system in virtually all U.S. regions in the GLSLS basin (Transportation Research Board, 2003).

The amount of volume carried by the rail networks in North America increased 50% from 1980 to 2003, while at the same time the available track mileage was reduced by 35% because of major restructuring and rationalization. Rail congestion is caused by bottlenecks particularly at Chicago, Illinois where the rail industry found itself short of capacity in the face of a forecasted increase of 45% in demand by 2020 (U.S. Chamber of Commerce, 2003). Bottlenecks have been an issue in the Quebec-Windsor corridor as well.

To be fair, since the onset of the financial crisis, congestion has declined although many expect the earlier trends to reassert themselves. Trucking congestion is primarily an intra-metropolitan problem as opposed to inter-metropolitan issue and is thus less likely to directly affect the marine mode. Also, complete transits of the Welland Canal, for example, can take ten hours or more, which helps to put road congestion into perspective. A telling aspect for marine will be the ability of the rail companies to deal with congestion and handle larger volumes.

Congestion is felt most by those living along trade corridors within urban environments where the supply and demand or cargo is greatest. The cost of congestion as a result of trucking in particular is passed onto unwilling inhabitants of the given urban environment in the form of time lost, increased fuel consumption and air pollution in addition to the increased cost of shipping goods that they consume.

3.5.5 Market Issues

Some of the most important possible exogenous changes relate to changes in markets. In particular, with the movement of goods being a derived demand, there can be changes in markets which affect the

level of demand for Seaway movements. Also, there are labour market issues that seem to be increasing in importance as an important exogenous force. With regard to the former, Chapter 1 describes the profound shifts that took place in the 1960's and 1970's relating to movements of grains and how restructuring of steel production led to changes in the localized demand for steel. More recently, the events at U.S. Steel in Hamilton have reduced the amount of Iron Ore moving through the Seaway by some two million tonnes per year. On the other hand, major investments by Parrish and Heimbeker at the Port of Hamilton related to the multi-modal movements of grains are providing an important boost. Overall, there is recognition that diversification of cargoes to the extent possible is an important strategic goal.

Labour market issues appear to be most pressing in the marine and trucking industries. Trucking is currently experiencing a driver shortage. In 2005, the U.S. had a truck driver shortage of 20,000 drivers that was projected to increase to a shortfall of 111,000 by 2014 (Global Insight, 2005). In 1993 Canada's Human Resource and Development Corporation projected the need for over 200,000 drivers by 2008. The driver shortage is caused by poor wages and working conditions, and the perception that it is not a job suited to young people (Human Resource Development Corporation, 2011). Longer distance trucking is hampered by the reality that many prospective drivers are not interested in routes that involve being away from home for extended periods of time.

In the Seaway marine context an overview of the labour market situation by Marinova Consulting et al. (2009) reveal that there is a grave shortage in skilled marine personnel and that a large proportion of the labour force is over the age of 50. The 2006 census revealed 800 employees in Ontario and 1400 in Quebec in key occupational categories (deck officers, deck crew, engineer officers, ship master and officers and others).

Conclusions

The marine mode on the Great-Lakes St. Lawrence Seaway is subject to something of a patchwork regulatory environment. The question is the degree to which this environment has hampered the development of the marine mode in the region and to what extent this same environment is limiting future potential. While these questions are challenging, this report has outlined some evidence that points toward answers. One important aspect to note is that there are interactions between numerous regulatory and non-regulatory variables that have created the outcomes of today. It is quite possible that, by the same token, changes would have to evolve on multiple fronts for the Seaway marine mode to approach its former volumes of the 1960's and 1970's.

4.1 Regulatory Themed

Too Many Chefs in the Kitchen: The overarching reality which defines the Seaway regulatory environment is the large number of federal/provincial/state and other entities involved. The GLSLS passes through many jurisdictions which have the ability to unilaterally enact policy that affects other jurisdictions and the operation of the Seaway itself. The recently concluded saga on New York State ballast water standards is one recent example. The contributions of the Seaway are too significant for such shadows to be cast over it. Marine carriers and shippers face a fragmented, unstable and uncoordinated regulatory environment. There would seem to be a need to act, especially on the U.S.

side, to limit the effective powers of individual states over the functioning of the entire GLSLS system. Alternatively, a sustained effort by the U.S. Government to create national standards for ballast water treatment and/or other environmental stressors of the GLSLS might be feasible.

After the 25% Duty - Now the Harbor Maintenance Fee?: The removal of the 25% duty on the import of foreign ships was long overdue since it aimed to support a virtually non-existent Canadian shipbuilding industry and was getting in the way of Canadian fleet renewal. The Harbor Maintenance Fee as it stands is getting in the way of the potential for short-sea shipping movements. Its existence in current form is almost a declaration that Seaway shipping is for large, singular movements of bulk commodities. All other types of movements are punished heavily in ways that similar movements by other modes would not be. Because the levy is linked to the shipper rather than the carrier, there is a large administrative burden attached to more complex movements that might involve multiple higher value cargoes. Moreover, the fact that the fee is based on value, while good for bulk movements, is not so good for higher value cargoes. To add insult to injury, the Harbor Maintenance Fund is ballooning in size and is not being spent at a high enough rate on the dredging projects it is meant to support. There are thus U.S. ports where vessels need to navigate very carefully or carry less cargo since dredging work has fallen behind. The Short Sea Shipping Act of 2011 is before Congress and aims to exempt non-bulk movements on the Seaway from the fee. The evidence strongly suggests that this legislation is a good idea although there is no guarantee that extensive short-sea shipping movements would take hold quickly.

The Jones Act Seems Entrenched: The Coasting Trade Act in Canada and the U.S. Jones Act continue to reserve cabotage/domestic movements to domestic flagged vessels. Accordingly, much of the U.S. fleet operates in the upper Great Lakes whereas Canadian fleets are more associated with the lower Seaway. Many U.S. vessels would not even fit through Seaway locks. Domestic marine trade is a protected, stable environment operating almost as two solitudes in the two countries and quite divorced from the dynamic and competitive international shipping realm.

One perhaps insurmountable barrier to regulatory liberalization is that the two countries involved have not formed a customs union, let alone a common market. While many note the success of free trade through NAFTA, that pact defines an arrangement that is considerably less integrated than what occurs in the European Union. In the EU, any EU member has access to the domestic shipping cargo of another member state. There is a charter vessel market which is responsive, offers short term arrangements and the ability to select a vessel from an efficient, large market that is size-to-fit.

The recent history suggests that the Canadian side is more open to the liberalization of marine movements on the Seaway. Marine liberalization was a Canadian objective during Free Trade Agreement discussions and during the NAFTA process, but overtures were always rejected by the U.S. side. Other than air freight, the marine mode is probably the most sensitive from a national security perspective and aspects such as having a strong merchant marine fleet and plenty of domestic maritime know-how have been viewed as fundamental. The Jones Act is seen as a piece of legislation which supports jobs and national security in the United States. The fact that it has a lot to do with driving up the cost of living in Hawaii, for example, is seen as a cost that must be borne for the greater good.

Another interesting point is that only 3% of American imports and exports are moved by American ships. From the Canadian perspective, the risks of relaxing the Coasting Trade Act are too high if the U.S. is not also doing the same.

While the U.S. and Canada have been focused on protecting the two marine domestic trades from one another, rail especially has benefited from considerable deregulation in recent decades. CN is operating as a continental railroad where a range of domestic movements in both countries are possible if regulations are obeyed. Trucking cabotage regulations in both countries are quite strict as in the marine context.

Since the Jones Act is unlikely to be eliminated, perhaps the best hope is some special arrangement that acknowledges the GLSLS as an important exception and critical to the economies of both nations. Legislation with this type of exception is being pursued now in the U.S. in reference to the Harbor Maintenance Fee. While there may be some industry participants that are happy with the status quo as it relates to cabotage, a more competitive vessel market and an ability to serve more ports with a single service would lead to a more flexible and competitive GLSLS and the highest probability that marine could compete effectively with rail and road for new cargoes. Cabotage liberalization in the Seaway context might also result in a common agreement on safety provisions, crewing, taxation, and fiscal support. Co-operation between the two federal governments has gone some way in creating a unified, stable policy environment relating to water levels and toll structures but much could still be done in areas such as cabotage.

The Marine Mode as a Preferred Mode: The official Canadian government policy is that of modal neutrality (CPCS Transcom Limited, 2009), which is arguably most favourable to trucking firms. Of course, this report has noted that in many contexts there are no alternatives to trucking. Rail intermodal services are very dependent on trucking for example. In other parts of the world such as Europe, marine is not viewed from a neutral policy perspective but rather is given preference. In Europe, a very high proportion of freight tonne-km are moved by truck, rail is not sufficiently competitive, and there is recognition that excess freight ought to be taken off roads where possible due to the high external costs imposed by the trucking mode. The Marco Polo programs are geared toward such objectives.

Another form of marine modal preference is the tonnage tax which is prevalent in Europe and many other international shipping nations and is very much oriented to marine competitiveness in the international sense. Recently, the concept was introduced in the United States. The tonnage tax can be viewed as being preferential in the sense that the amounts paid typically end up being low, relative to other modes, and the process is quite streamlined with little red tape. Canadian shipping firms operating in Canada are protected by the Coasting Trade Act but the down side is that they pay taxes on associated profits just as any Canadian firm would. Canada has introduced the concept of the International Shipping Corporation to allow Canadian “mind and management” to compete in the low tax world of international shipping but associated firms are not incorporated in Canada and Canadian flagged vessels are not competitive in the international arena.

There are some arguments for the Canadian government to re-consider the extent to which its mode neutral policies are out of step with some more successful sea-faring nations. One argument is that Canadian marine clusters, particularly in the Seaway context, are small by international standards. Another argument is that competing well internationally might be a recipe for competing at a higher level for domestic marine movements and potentially against other modes. A third argument is that the marine mode arguably imposes less in the way of external costs. One counter-argument is that the rail mode in the region does a much better job of taking trucks off the road than does the rail mode in Europe and imposes much lower external costs than trucking.

The Contrast between Pilotage and Customs: In comparing the situation that prevails on the Seaway when it comes to pilotage and customs, some stakeholders would argue that too many pilotage assignments are taking place while customs is not being active enough!

The pilotage costs associated with bringing local navigational specialists on board a vessel are in the vicinity of $14,000 to $17,000 for a trip between Hamilton and Halifax. Interestingly, these rates are quite competitive with other jurisdictions around the world. Even so, profit margins will be slim for any new marine service and this amount alone could be the difference between a profit and a loss. The rules are most strict in Quebec under the Laurentian Pilotage Authority where pilots are mandatory in the designated areas, which is not the case in Ontario under the Great Lakes Pilotage Authority. There is no exemption for an experienced captain in Quebec. One observation about pilotage is that the domestic purchasers of the mandatory services, especially in Quebec, appear to feel strongly about the need for more general flexibility in pilotage regulation.

With respect to marine customs operation in Canada, there is a problem of under-availability that stands out starkly in relation to other modes. It is common for Canadian Border Services to be available only during business hours and for $100 per hour fees to be charged should overtime be required of an agent. Rail and road receive 24 hour border service. While the nature of the service is likely consistent with the lower urgency associated with the movement of bulk goods, these types of practices would need to change if the movement of higher value non-bulk goods increases. In this context, it can be argued that Canada is not obeying modal neutrality but instead is favouring the other modes. On the U.S. side, there are marine border issues having to do with the Department of Homeland Security requiring 24 hours notice prior to the arrival of a vessel.

Environmental Regulations have not been a Major Factor: It does not appear that environmental regulations that have actually been put in place have been a significant factor in hampering Seaway goods movement. On the other hand, the threat of new environmental regulation, such as the recently averted New York State ballast water standards, have been capable of putting a real chill over the Seaway investment environment almost as powerful as the winter closure itself. The two Seaway management corporations established high ballast water standards in 2008 to combat the arrival of new invasive species. If anything, these regulations came too late as a lot of damage had already been done. Some have speculated about the closure of the Seaway itself as a way of combating the problem but it appears to be almost universally agreed that such a measure would be draconian and not likely to improve the situation anyway.

While calculations of total external costs across all modes can be complex, the marine mode is generally perceived as the cleanest of the modes, which helps to reduce the risk of burdensome environmental regulation. One area in which the marine mode is not the cleanest has to do with the emissions of sulphur oxides. Seaway operators are being asked to adapt to regulations which will reduce sulphur levels in marine fuels to very low levels within a few years. Accordingly, many lake vessels are undergoing engine overhauls. There were objections in 2010 to timelines for enforcement and inequities with the new U.S. rules but the more moderate approach of "fleet averaging" may potentially solve the issue. Overall, the new regulations appear to be prudent as sulphur oxides is the main marine emissions weak spot in relation to other modes.

4.2 Non-Regulatory Themed

Chapter 3 of this report dealt largely with non-regulatory variables and how they impact the choices between modes that shippers within the region are making. Table 4.1 provides a summary of the overall results of the analysis. Each variable/criterion is considered in turn with a colour coding of green if the associated mode has the best characteristics of the three and red if it has the least favourable characteristics. Amber covers the middle ranking. The main thing to note is that the trucking mode is most often green whereas the marine mode is the most often red. Clearly, Seaway marine has inherent challenges that are related to much more than just regulation.

Table 4-1: Ranking of Modes in Seaway Region by Cost and Quality of Service Criteria

Cost or Quality of Service Criterion	Road	Rail	Marine
Dependence on Achieving Economies of Scale			
Logistics and Inventory Costs			
Line Haul/Fuel			
Vehicle/Vessel Costs			
Handling Costs			
Crew Costs			
Pilotage Costs			
Year Round Operation			
Range of Served Locations			
Timeliness			

Here is a brief summary of the classification rationale for each variable. The classifications are somewhat subjective considering that differing contexts apply (e.g. containerized goods versus bulk goods):

- **Dependence on Achieving Economies of Scale**: Consider that rail and marine are both quite capital intensive and dependent on operating at a very large scale. It is necessary to achieve economies of scale in order to succeed. While it can be argued that the largest, most efficient trucking firms gain efficiencies from achieving a large scale, there are also many successful tiny owner-operator firms. Rail must invest enormous amounts to maintain its own right-of-way, which is a large component of total costs.

- **Logistics and Inventory Costs**: Essentially this item links to the time value of goods. Quite simply, the higher the value of goods, the less time that can be spared for the goods to be lingering in transit or in inventory. With the exception of project and dimension cargo, the Seaway marine mode generally carries bulk goods that are of much lower value per unit. For this reason, the winter closure for such goods can be handled by simply accumulating inventory late in summer to see the operation through until spring. With high value goods and just-in-time supply chains, such an approach is unworkable. The ranking across this category is simply based on the relative ability of each mode to cope with modern day supply chains and higher value goods. For the highest value of goods to be shipped over long distances, of course, air freight comes into play but its market share of tonne-km is a sliver.

- **Line Haul/Fuel**: The key marine advantage is the lowest line-haul costs per tonne-km with trucking lagging behind rail by a large margin. Trucking is also the most likely to be harmed in this respect by a large increase in fuel prices. Interestingly, tonnage flows within the Seaway region showed that rail was actually carrying more than marine in many of the longest distance moves between Central Canada and the East Coast. Also, self-unloading vessels have higher line-haul costs than more basic lakers but are generally viewed as highly effective due to their superior flexibility.

- **Vehicle/Vessel Costs**: In terms of the actual vehicle/vessel trucking is cheapest. A tractor and trailer combination can be purchased for $200,000 to $300,000. Freight locomotives are in the range of the $2 million per unit while rail cars are considerably less. Obviously, there can be a wide range in marine vessel cost depending on the vessel but $15-$18 million is a likely minimum range. Considering that a new marine service might well be started by a small, under-capitalized firm, the costs to finance such a purchase would be challenging.

- **Handling Costs**: Associated with achieving scale economies are large vessels/trains that are more difficult to unload than a simple truck. For the unloading of containerized or bulk goods in this region, the rail mode has developed highly efficient intermodal and transloading facilities. Since marine containerization is poorly established upstream of Montreal, handling cannot be as efficient as rail. For large amounts of bulk goods, it can be argued that the self-unloader is arguably the most efficient in certain contexts.

- **Crew Costs**: On a man-days per TEU basis and to ship over some significant distance, trucking is by far the most costly and this issue is exacerbated by driver shortages. On this same basis, rail comes out ahead of marine in that substantial cargo amounts can be moved with relatively little manpower.

- **Pilotage Costs**: While this is a non-issue for road and rail, pilotage is a significant cost in sending a vessel through the most challenging segments of the Seaway route as was outlined in Section 4.1.

- **Year Round Operation**: Evidence suggests that the winter closure of the Seaway is a serious barrier that mitigates against the movements of higher value goods by the marine mode. An annual closure is completely out of step with the efficient functioning of modern day supply chains. While the closure is not good in the context of expanding marine movements, the reality is that the closure also appears to be necessary due to challenges associated with operating and traversing the system of locks in winter. While the other two modes have their issues during winter, they are open for business year round.

- **Range of Served Locations**: Since trucks can go virtually anywhere, trucking cannot be beaten on this aspect and in fact the other modes are dependent on trucking themselves. This dependence on trucking has largely put the rail mode in a more favourable position relative to marine in this region because the majority of goods movement facilities and services (i.e. warehouses, logistics facilities, freight forwarding, wholesaling etc.) is quite suburbanized. Peel Region is the goods movement center of Ontario and is quite suburban and oriented toward highway and rail infrastructure. Rail is also offering advantages over Seaway marine in the extent of its network. CN is operating on a continental scale and thus can quickly reach places that, in the case of marine, might require a passage of the Panama Canal.

- **Timeliness**: There are actually few long-distance routes in Canada where trucking is not competitive in terms of timeliness. A Toronto to Vancouver trip could be completed in 57 hours by a single driver obeying the regulations. In the rail context, there are always risks of failing to make a truck-rail connection in time and for the shipment thus having to wait until the next service. Bulk carloads can linger in rail yards for surprisingly long periods of time with Chicago being noted as particularly problematic. Marine is generally the slowest moving of the modes but it should be noted that self-unloaders are capable of making a series of deliveries to different ports in a time efficient manner. The recently introduced Algobay can unload 5,000 tonnes per hour. Rail has a weak spot for some shorter hauls that marine may be able to exploit, especially in an environment of higher fuel prices which would disproportionately affect trucking.

Having reviewed the main criteria/variables over which the modes with the region can be compared, there are a few other concluding observations that can be made before moving on to an overall conclusion.

The Role of Geography: Simple geography plays a big role in the Great Lakes-St. Lawrence system. For one, the Seaway straddles the border between Canada and the U.S. for much of its length with the result that the system is inherently international with all of the associated implications. For the other modes, the border is something that can be crossed and then any regulatory ambiguities become a minor issue (e.g. CN Rail) or have been overcome. Another unfavourable aspect of geography is that land distances in the region between major metropolitan areas are not substantially in excess of water distances. The land distance between Montreal and Toronto, for example, may even be less than the water distance. It is much easier for the marine mode to compete in circumstances where it offers

significant distance savings between heavily-populated urban centres in comparison to the land-based modes.

Rail is a Very Worthy Competitor: This review has revealed that the relative success of the rail mode in Eastern Canada and North America has certainly helped to limit the potential for cargo growth on the Seaway, particularly in the realm of containerized goods. It is important to note that rail is even more competitive in the movement of containerized goods than it is for bulkier goods. Rail infrastructure such as intermodal terminals and transloading centres are generally better positioned in locational terms to integrate with the other economic elements of metropolitan supply chains such as wholesaling, warehousing, freight forwarding and others and with far reaching connections on its extensive continental scale network. Rail is also quite competitive against marine in an environmental sense, which helps counteract one of marine's main advantages. In considering Seaway comparisons to European marine success, it is important to consider that rail freight is not the force in Europe that it is here in Canada and the United States.

Trucking Offers Many Advantages: Trucking plays a pivotal role in moving goods at the intra-metropolitan scale and in many medium distance and in some long distance contexts. On selected corridors, such as Montreal-Toronto, trucking offers stiff competition against both marine and rail. What trucks do at the local level cannot be imitated by either marine or rail. Intermodal rail services are successful because they seek to imitate the service that would be provided by a truck while mixing in some superior rail economics. Overall though, there is limited overlap in the services provided by marine and trucking within the region. To the extent that longer truck trips can be taken off the road, the rail mode is often in the better position to do it. The CP Expressway service between Toronto and Montreal literally already does take truck trailers off the road. There may be scenarios where trucking and rail can complement one another. One example might be a truck ferry across Lake Erie to greatly reduce distance and travel time between centres such as Cleveland, Ohio and London, Ontario.

The Challenge of Starting from Scratch: Any new marine services in the region ideally should commence under the premise that the service will offer some compelling improvement on the services by other modes that are already out there. This thinking is true of any new service that is seeking to penetrate an existing market that is already fairly well served. Studies highlighted in this review indicate that there are a great many marine scenarios where costs are very high and uncompetitive and only a minority where costs could be even theoretically competitive. For new services and new cargoes, it will not be an easy thing to dislodge the incumbents and generate sufficient business on the revenue side.

Boosts to Marine from Exogenous Sources: The functioning of the three main modes within the Quebec-Ontario Corridor seems to be in a fairly stable equilibrium. None of the three main industries is particularly fast growing (to a large extent, rail has grown from rationalizing) and the patterns of how goods move in the region are fairly well-established. For marine to make significant headway in terms of moving more goods of higher value, there will need to be some significant exogenous change. The most likely high-impact change would be an increase in goods movement traffic that is so large that the rail and trucking modes become too congested to handle it. Up until the onset of the financial crisis, there were studies suggesting that such a scenario was quite likely to play out and there was a

widespread call for short-sea shipping to relieve the burden. These calls have faded to some extent and in the mean time, congestion levels are down from the middle of the last decade. A major shift in environmental regulations to internalize external costs would be most harmful potentially to trucking but rail would be well-positioned to benefit. Some short-sea shipping opportunities might arise in conjunction with changes induced by higher fuel prices.

4.3 Overall

In terms of some overall findings from this research, the evidence is clear that regulatory obstacles have not been the main determinant of declining Seaway tonnages since the 1970's and nor do they promise to be the main constraint that holds the Seaway back in the future. To the extent that the Seaway is underutilized relative to its capacity, non-regulatory factors offer most of the explanation. In terms of whether the Seaway has been suffering from unfavourable or inaccurate perceptions of the marine mode, the evidence suggests that perceptions in general have been accurate and that shippers overall have been making reasonable choices in terms of mode selection. The Seaway is enormously important in terms of its contribution in this region but in terms of growing the flows of cargo substantially beyond current levels, the rail and trucking modes are offering stiff competition and meanwhile, a large share of goods movement oriented facilities are suburban and not port-oriented. The winter closure of the Seaway is a very significant issue and likely the largest single reason that higher value goods are not marine transported in larger quantities.

To say that the regulatory environment has not been the leading determinant of marine volumes does not mean that there are not some glaring problems. It appears that some of the most significant regulatory issues have emerged on the U.S. side of the border. The Harbor Maintenance Fee is a clear barrier to higher value, short-sea shipping oriented services more so due its administrative burden, although the monetary burden is significant. The ongoing threats of unilateral environmental regulations at the state level have a chilling impact on the willingness to make investments. Barriers to cabotage liberalization, which reduce the options for short-sea shipping services, appear to be strongest on the U.S. side with many stakeholders strongly supportive of the Jones Act. Part of the explanation for problems being U.S.-specific is that, for a variety of reasons, the Seaway is proportionally more important to marine activities in Canada than is the case in the United States. It is therefore harder to generate the support for policy changes south of the border.

With the removal of the 25% duty on imported ships, Canada's regulatory house is much more in order. With respect to cabotage, it will be difficult for Canada to liberalize without similar steps from the U.S. side. Two potentially manageable issues that can be addressed on the Canadian side are more reasonable pilotage regulations (perhaps in co-ordination with the U.S.) and better support from Canadian customs for cross-border marine movements from the U.S. There is potential to do more in Canada, as has been the case in the European Union, to make marine a preferred mode. New regulations to clean up ballast water and sulphur oxides emissions are making marine even more environmentally attractive. Following the lead of many other sea-faring nations, including the U.S., the adoption of a tonnage tax in Canada could result in more Canadian-flagged vessels, more participation in

international trades and greater possibilities for the establishment of significant marine clusters that could assist the further development of the Seaway.

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