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The Present and Future of the St. Lawrence-Great Lakes Waterway: What Are the Issues?

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**The Present and Future of the
St. Lawrence-Great Lakes Waterway:
What Are the Issues?**

by
Jean-Claude Lasserre
Professor, Université Lumière Lyon 2
TDC Visiting Expert, January-June 1997

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16. Abstract <p>The report describes the constraints on the growth of the St. Lawrence-Great Lakes waterway. It discusses the impact of recent technical developments, such as "jumbo" ships and containerization. Finally, it considers the impact of certain federal government proposals concerning the future administration of the system.</p> <p>The study revolves around the concept of a "gateway", an entry to the continent formed by the St. Lawrence-Great Lakes system, and compares it to the Mississippi system and other groups of ports in North America. Changes in traffic in the various gateways are discussed to highlight certain trends that will change the system's commercial future, such as the relative stagnation of traffic on the Atlantic coast compared to increased traffic on the Pacific coast, and intermodal competition.</p> <p>The changes observed require a significant shift in stakeholders' behaviour in order to increase the competitiveness of the St. Lawrence-Great Lakes waterway, not only with other gateways, but also with rail and road transportation.</p>					
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16. Résumé <p>Le rapport décrit les contraintes qui influent sur l'évolution du système navigable Saint-Laurent/Grands Lacs. Il souligne les effets des développements techniques récents, tels que le gigantisme des navires et la conteneurisation. Enfin, il s'interroge sur l'impact de certaines propositions du gouvernement fédéral concernant l'administration future du système.</p> <p>L'étude s'articule autour du concept de «<i>gateway</i>», ou porte continentale, que forme le système Saint-Laurent/Grands Lacs, et le compare au système du Mississippi et à d'autres agglomérations portuaires de l'Amérique du Nord. L'évolution des trafics de ces différents «<i>gateways</i>» est signalée afin de faire ressortir certaines tendances qui modifieront le devenir commercial du système, telle que la relative stagnation du trafic sur la côte Atlantique, en comparaison avec un trafic croissant sur la côte Pacifique, ainsi que la compétition intermodale.</p> <p>Les transformations observées appellent à de sérieuses révisions de comportement de la part des acteurs en présence afin d'augmenter la compétitivité de la voie d'eau Saint-Laurent/Grands Lacs, non seulement face aux autres «<i>gateways</i>», mais aussi face au rail et à la route.</p>					
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FOREWORD

Upon obtaining sabbatical leave from the *Université Lumière Lyon 2* and the French *Ministère de l'Éducation Nationale*, the author received a grant to support his first stay in Montreal (January-February 1997) from the Canadian Department of Foreign Affairs and International Trade through the Canadian Embassy in Paris. The Transportation Development Centre (TDC) of Transport Canada was then kind enough to fund two additional stays, in March-April and May-June 1997. During this entire time, he was made welcome at TDC in Montreal and had access to the full range of its resources.

The author expresses his gratitude to the TDC team, as well as to all agencies and institutions who made possible this experience in a different professional environment. This report was written during the stays. The author hopes that it will contribute to ongoing discussions regarding commercial navigation on the St. Lawrence-Great Lakes system.

SUMMARY

The St. Lawrence-Great Lakes system has no equivalent in shipping anywhere else in the world: plying a 3,700-km stretch of water, ocean-going and inland ships with an average capacity of 25,000 to 30,000 deadweight tonnage (DWT) have only 15 locks to go through between the Atlantic Ocean and Chicago, 16 if they continue on to Duluth. They serve an area of North America that is home to almost two-thirds of Canada's population and two-thirds of its industries, and one-fourth of Americans and U.S. industrial facilities. Can this powerful tool remain one of the motors of economic development in the regions concerned (Quebec and Ontario) as it has been in the past?

At a time when ways are being sought to revitalize the Canadian economy, we need to assess how the system operates and its potential. There are two sides to the system – it belongs to the worlds of both ocean-going and continental transport, and it faces competition in two areas: that which is developing between owners of ocean-going ships and between ports of call, and that which is developing between transcontinental modes of transport.

In the 30 years between 1960 and 1990, the tonnage of merchandise transported at sea quadrupled. During the same period, international seaborne trade in the United States and Canada tripled. This explosion in marine transport can be explained by a number of factors that come under the heading “economic globalization” and by two major technical revolutions.

The first revolution lies in **“jumbo” ships and specialization in bulk shipments**, which increased the size of merchant ships from 10,000 DWT in the 1940s to several hundred thousand tonnes today.

The second technical revolution involves the **unitization of loads and the expansion in size of general cargo**. The main factor in this revolution is containerization, which considerably reduces ships' turnaround time in ports, despite their increasingly large size: the unit capacity of the newest ships is 6,000 twenty-foot equivalent units (TEU) and will soon be 8,000.

The consequences of the revolution in ocean-going transport are twofold: veritable floating intercontinental bridges have been created on the oceans while **the huge increase in ocean traffic necessarily leads to a huge increase in intracontinental traffic**. Trucking is the worst-equipped mode of transport (small load size, saturation of infrastructure in the main centres) to deal with the problem and, to meet this demand from the hinterland, shipowners are increasingly relying on their feeder services and rail networks, when they exist. It is within this completely renewed framework that we need to evaluate the St. Lawrence's position.

This evaluation will not involve a comparison of ports, but rather groups of ports built on the main North American gateways. A gateway has the following characteristics:

- it is a port complex that combines large amounts of bulk traffic with a significant amount of movement of general cargo and containers;
- the port complex has at least three, if not four, modal connections with its hinterland;
- finally, the port complex has an advanced service sector with all port-related commercial, banking and management operations in the main downtown area.

All of these characteristics enable a gateway to play a stimulative role in the regional, and even national, economy while serving as a major catalyst for intracontinental transport traffic. Does the St. Lawrence River port complex belong in this category?

In order to answer this question, and in view of the increasing continent-wide competition between ports, we have to look at the trends in traffic on the St. Lawrence versus traffic on the Mississippi and that of other major North American port complexes. Then, using these data, we have to try and evaluate the St. Lawrence gateway in comparison with other gateways emerging on the continent.

A comparison of trends in river traffic on the St. Lawrence and the Mississippi provides a great deal of information, despite the differences between the two inland shipping systems and the very different statistical systems used. For the St. Lawrence, data are only available on the central portion of the shipping system between Montreal and Lake Erie. Between 1960 and the end of the 1970s, traffic increased from 30 to roughly 75 million tonnes (MT); however, since then, it has fallen for the most part.

In contrast, there appears to be a great deal more traffic on the Mississippi River; it rose from 450 to almost 700 million short tonnes (MST) between 1975 and 1994 throughout the Mississippi system. There was an almost steady increase, except between 1982 and 1985 across the entire system and on its main course, and between 1979 and 1983 on the Ohio River. These trends show that competition between the two inland shipping systems and between their sea ports is on the way to becoming a North American fact of life.

Trends in ocean port complex traffic can be observed statistically using data available in Canada and the United States. On the Canadian side, all of the main ports on the St. Lawrence have remained at 90 MT since the early 1980s while the Atlantic ports only grew from roughly 15 to 30 MT between 1970 and 1995 and the Pacific ports from 30 to 90 MT during the same period. The same three port complexes shared almost 94 percent of the containerized cargo in Canada in 1995, with Montreal far ahead in first place; Halifax, in second place until 1990, was overtaken by Vancouver as of 1991.

Some of the same contrasts can be seen in the United States: small declines (e.g., Baltimore) and large ones (e.g., New York) in traffic in the main megalopolitan port complexes; fairly stationary traffic in smaller ports on the south Atlantic coast; substantial growth in ports on the Gulf of Mexico, particularly those in the Mississippi delta, which far and away make up the largest port complex in the United States (438 MST in 1995!); finally, growth in port complexes on the Pacific coast, with the Long Beach/Los Angeles group going from some 45 to 100 MST between 1970 and 1995.

The picture is quite different with regard to containerized freight across the continent. While the Pacific coast is distinguished by the strength of its traffic in a small number of ports (10.7 million TEU in 1996), the Eastern seaboard receives slightly less traffic (8.5 million TEU 1996) at a larger number of ports, with the main one, New York, hitting a high of 2.2 million TEU. In contrast, the Gulf of Mexico has a very small role, with only 1.2 million TEU, most of it through Houston.

For its part, the St. Lawrence port complex is fairly well placed as a gateway because it combines the main characteristics we described: trimodal access to the hinterland, a combination of bulk cargo and container traffic and the presence of a not insignificant multifunctional hub in downtown Montreal. Although similar to the Mississippi port complex, its 3,700 km long waterway is bigger and, unlike the Louisiana ports (and the Eastern seaboard in the United States), ports on the North Shore of the St. Lawrence can accommodate the largest ships. Montreal's container traffic has been increasing steadily. The port combines two characteristics that are not usually found together: it is both an ocean port and a multimodal inland platform, and benefits as well from very convenient rail access to the hinterland of the Great Lakes and the Midwest.

Should we not be making better use of the exceptional niche offered by the position of Montreal and the St. Lawrence gateway? Is Canada aware that its ports are facing competition from across the continent and is it doing the most, in co-operation with the provinces concerned, to promote its gateways, both those in the East and in the West?

The St. Lawrence waterway is not just a gateway; it is also a transportation hub leading to the heart of the continent and, as such, a logistical tool used by a number of major industrial sectors in Quebec, Ontario and American states along the Great Lakes. Moreover, the St. Lawrence-Great Lakes system is distinctive because two different fleets coexist along it: a fleet of sea/river-going vessels specially built for the system with unit capacities of 30,000 DWT, and a fleet of inland ships or lakers that usually have a unit capacity of 27,000 DWT, although some lakers in the American fleet upstream of the Welland Canal have a capacity of up to 65,000 DWT. A third fleet downstream of Montreal is made up of sea-going vessels.

This explains the complexity and the complementarity of traffic. The complexity lies in the fact that some of the traffic is related to the gateway, some to intracontinental transport. The traffic also overlaps since ocean, sea/river-going and laker fleets can carry the same cargo. Thus, farm products are transported all along the system on both

lakers and sea/river-going vessels (and downstream on ocean-going vessels), which means that the gateway's function is important not only for St. Lawrence ports, but also, in a small but not insignificant way, for all of the ports in the system.

The complementarities of the traffic are twofold:

- some shipowners are able to obtain cargo in each direction for their vessels, whether they be lakers, sea/river-going ships or ocean-going vessels;
- some vessels carry freight from the gateway and freight travelling inland only.

There is another difference between the inland and sea/river-going fleets. With the decrease in traffic of farm products and iron ore, the inland fleet is faced with a certain amount of overcapacity. In contrast, sea/river-going fleets continue to include a large number of chartered vessels to deal with the infrastructure closing in winter upstream of Montreal and changes in the market from one year to the next while bravely renewing the ships in their own fleets.

Other difficulties facing shipowners result from **increased intermodal competition at the expense of the waterway**. Several cases are analysed:

- for container traffic, competition comes from Halifax and the Canadian National Railway (CN);
- for liquid cargo, and more specifically the distribution of refined petroleum, once again CN offers a controversial alternative between Quebec City and Montreal with its Ultratrain;
- for dry bulk cargo, CN has captured a feed-grain market from the Prairies to the maritime provinces while directly transporting farm products destined for export from the Prairies to the Port of Quebec.

All of these cases have led to a great deal of discussion, but the lesson to be drawn seems to be that we need to recognize that the waterway also has to try and improve its competitiveness.

It is in this context of increased port and intermodal competition that the Canadian government has decided to intervene in the waterway transportation sector: reform of the port system, reorganization of the Seaway, review of the pilotage policy, transfer of the Coast Guard from Transport Canada to Fisheries and Oceans Canada and the implementation of a cost-recovery policy.

Although there are historical precedents (such as the companies behind the Suez and Panama Canal projects), as we reach the end of the 20th century, the "commercialization" of the Seaway, awarded to a private group, would be a world first.

For the moment, major international waterways are the direct responsibility of governments.

There are **two sides** to the St. Lawrence-Great Lakes waterway, as it is both one of the most important gateways in North America and a valuable intracontinental transportation tool used by a number of major industrial sectors. However, it is under increasing threat from the rise in continent-wide competition on both sides. Competition is coming from several major ports, particularly those in Western Canada, on the Mississippi and on the Eastern seaboard; and intermodal competition shows the railways' increasing competitiveness and underscores the comparable efforts that have to be undertaken for the waterway. From this point of view, the systematic use of adjectives such as "marine" and "sea" to describe the system is misleading as they only refer to the first leg in the journey and ignore the system's role as an intracontinental transportation tool as well as the competition that the system has to face today. Would it not be better to call it a waterway transportation system?

Moreover, the sweeping changes in the transportation sector that have been described require each of the players working in the shipping system to seriously review their operations with a view to increasing their competitiveness with other gateways and other modes of transportation. From this perspective, we can say that we have **a water transportation system that has no option but to evolve.**

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1. INTRODUCTION

The St. Lawrence-Great Lakes system is one of the most important geographical features of Canada and, more specifically, Quebec. The system and its tributaries are a source of abundant, inexhaustible hydro-electric resources, as evidenced by those impressive temples to technology, the Beauharnois, Cornwall-Massena, Niagara, and Sault Ste. Marie power plants.

The system is also an excellent navigational waterway. To the west, the Great Lakes constitute a remarkable inland sea, reputed to account for one-tenth of the world's fresh water reserves. The St. Lawrence to the east is much more than a path to reach them: it is both a strait between two seas (the Great Lakes and the Atlantic) and a major inlet, encompassing broad lakes and a wide estuary. At the Saguenay confluence, the strictly marine outlook in both directions is so striking that an observer on board a sailboat has the physical sensation of being in a sound – which, in reality, is the grandest portal to the North American continent. This region's beautiful landscapes are increasingly popular, particularly with ever-larger cruise ships. Finally, commercial shipping enjoys access to a waterway without peer anywhere in the world, where ocean-going or inland vessels of up to 27,000 tonnes deadweight capacity can operate over 3,700 km from the Atlantic Ocean to Chicago, or to Duluth at the head of Lake Superior. Over this entire distance, vessels encounter only 15 locks to reach Chicago, and 16 to reach Duluth. These locks, too, are the work of giants – monuments to technology whose grand scale can be measured by witnessing the passage of a ship, or better, by visiting one of these locks in winter, when there is no traffic at all!

This report surveys the operation of the St. Lawrence waterway. Commercial shipping, rail and truck transport activities through the ports of this waterway serve a region of North America containing two-thirds of the population of Canada and two-thirds of Canadian industry, as well as one-fourth of the population and industry of the United States. The report will investigate whether this remarkable tool can still drive the economic development of Quebec and Ontario regions along its banks.

This issue is especially relevant because of the fundamental role played by the St. Lawrence in Canadian economic growth and development. For three centuries the St. Lawrence was the point of entry to Canada for immigrants, equipment and innovation, and the point of departure for continental riches and commodities that, one after another, drove Canadian economic development: furs, wood, farm produce (especially grain) and, finally, mineral ore. These commodities formed the basis of a number of commercial empires along the St. Lawrence, which made up the geopolitical backbone of Canadian history¹ (Lasserre, 1980 and Camu, 1996). In addition, the St. Lawrence fostered major industries that took in bulk cargoes, added value to them and sent the finished products on their way: mills and other agri-food industries;

¹ This is a far too hasty treatment of a considerable portion of Canadian historical research, initiated by H.A. Innes and D.G. Creighton.

shipbuilding; sawmills and pulp and paper plants; ore processing plants; metal and mechanical industries; and so on. Even today, most heavy industry on the shores of the St. Lawrence and Great Lakes depends heavily on the hydro-electric resources of the St. Lawrence basin, and uses the St. Lawrence waterway to bring in raw materials and transport processed goods to market.

The role of the St. Lawrence gateway in the economic development of bordering regions is particularly relevant, because the federal government is developing new policy with respect to this waterway as part of an in-depth review of its role in Canadian transportation. Although Parliament could not definitively adopt Bill C-44 (the *Canadian Marine Act*) before the House of Commons was dissolved in the spring of 1997, this bill will certainly be back on the order paper (in an identical or revised version) in the fall of that year. Bill C-44 applies to all coastal areas of Canada, as well as the St. Lawrence-Great Lakes system.

In fact, the St. Lawrence-Great Lakes system has two roles, in that it accommodates both seagoing and inland shipping over its entire length. Consequently, the system is important from the point of view of both shipping and inland transport, and faces growing competition on both fronts. In particular, competition is increasingly fierce among ocean shipping companies and among the ports these companies use. By extension, competition is keen between inland transport modes and between operating companies within each mode.

The issues facing the St. Lawrence gateway are considerable, therefore, and fully justify this comprehensive (if preliminary) survey. To begin, the survey examines the nature and original characteristics of this continental gateway, primarily the driving force behind all of the changes in freight transportation now occurring across the continent, that is, the revolution in ocean transport.

2. THE ROOTS OF INCREASED COMPETITION: THE CURRENT REVOLUTION IN OCEAN TRANSPORT AND ITS CONSEQUENCES ON LAND

Since 1960, ocean transport has undergone two revolutions: one commercial (in the explosion of trade flows), the other technical (jumbo ships and increasingly specialized and speedy loading and unloading operations). As often happens in human history, these two revolutions go hand in hand; hence it is very difficult (and probably pointless) to determine which of the two caused the other. In fact, they reinforce each other: trade requirements drive improvements in tools, and expanding supply encourages demand.

2.1 The Shipping Explosion

Between 1960 and 1989, total cargo transported by sea grew from 1 to 4 billion tonnes per year. Although close to 4 billion tonnes yearly were transported in the late 1970s, there was a significant drop in annual tonnage in the early 1980s, so that by 1983 annual flows had declined to 3.2 billion tonnes. The primary cause of this drop was a decline in hydrocarbon traffic, which ceded its dominant position in world shipping to dry cargoes (bulk and general cargoes). This expansion in ocean traffic has been supported by very rapid expansion in international trade for all transport modes, which grew (in constant dollars) from just over \$100 billion in 1960 to \$3,000 billion in 1989 and more than \$3,600 billion in 1992 and 1993. (Note, however, the influence of inflation and the devaluation of the dollar in 1971 and 1973 on these trends.) (*Statistical Abstract of the United States*, 1995)

In most countries, these trends have been reflected in a rapid rise in international commercial shipping. In the United States, for example, international marine freight traffic more than tripled between 1960 and 1995. More precisely, while total water transport in the United States increased from 1,099 to 2,240 MST (million short tons) in this period, inland transport (river and coastal shipping) increased modestly (from 760 to 1,093 MST) while international shipping grew from 339 to 1,147 MST and surpassed domestic traffic starting in 1994 (U.S. DOT, 1997). In Canada, by contrast, international shipping has regularly exceeded domestic water transport in recent decades. Growth in both countries is somewhat comparable, however: between 1961 and 1995, domestic traffic grew from 42.1 MT to 100.6 MT, while international traffic skyrocketed from 84.2 MT to 259.8 MT.²

² Figures from Tables 25 to 28 of the 1961 *Shipping Report, Part V* (cat. 54-207) are given in million short tons (46.4 MST for domestic traffic, 92.9 MST for international traffic) and were converted to million metric tonnes for comparison with data from *Shipping in Canada*, 1995 (cat. 54-205XPB), chap. 1, pp. 13 and 15.

This rapid growth in shipping traffic since the 1960s can be traced to a number of factors, such as the world demographic explosion, governmental economic expansion policies during much of this period, and a number of international trade programs established by large international organizations such as GATT, OECD, UNCTAD, IMF, and the World Bank. Furthermore, industrial economies moved from a “paleo-technical” phase based essentially on coal and iron ore and involving little international trade, to the current “neo-technical” phase in which no country has all the resources it needs and must import some of them, frequently from other continents. This phenomenon has given rise to an “international” economy, which has developed into an “intercontinental” economy and now a “global” economy.

Another significant factor driving this trend is the emergence of various forms of international economic and trade association or integration: free trade agreements and common markets (the two main examples of this are the EC, later the European Union, and NAFTA), which stimulate trade among their members and subsequently (through major international agreements such as GATT) among themselves. Furthermore, the rise of multinational corporations, which disperse the various stages of their manufacturing processes around the world in search of the best location for each, has played a highly significant role. In particular, more labour-intensive production processes are frequently “de-localized” to geographic areas (such as Asia) where wages are low, causing massive layoffs in industrialized countries. As a result, the international trade picture includes increasingly large shipments of semi-finished products that travel long distances between plants of the same multinational firm or group of firms, in addition to shipments of raw materials and finished products. This international dispersion of manufacturing processes for a single product has been made possible by a significant drop in shipping costs, itself a product of technical revolutions in ocean transport.

This technical revolution derives from a single observation, which became evident in the early 1960s: that “a merchant vessel is supposed to sail, that is, produce as many tonne-kilometres as possible.” Therefore, vessels should not spend half the year in port, as was customary in those days because of the considerable time necessary to load and unload cargo. This realization led to highly significant changes in shipping in two main areas: bulk cargoes, which are characterized by very large, specialized vessels and specialized loading/unloading operations; and general cargoes, where various forms of unitization (such as containers) have speeded up loading/unloading operations considerably.

2.2 Size and Specialization in Bulk Cargoes

The WWII “liberty ships” had a unit capacity of only about 10,000 DWT (dead weight tons). The rise of bulk shipping in the 1950s and technological advances in shipbuilding, by contrast, produced specialized, high-capacity vessels: oil and mineral tankers in 1955, methane tankers in 1965, and, not long after, cement and liquid sulfur tankers with unit capacities exceeding 100,000 DWT. In fact, the largest vessels ever constructed are

oil tankers with up to 550,000 DWT capacity. This figure defies comprehension and begs for a concrete illustration. Four oil tankers with this unit capacity were constructed in the St. Nazaire shipyards in the 1970s. Each of these vessels is 414 m long (the steamship *France* – later the *Norway* – was only 300 m long) and 63 m wide, with almost 36 m under the deck and a 28.5 m draft. A. Vigarié (Vigarié, 1979) has noted that if one were to unload the cargo from these four structures into rail tank cars, by the end of the operation the locomotive of a train being loaded in Nantes would be in Geneva, and that of a train being loaded in le Havre would be in Cologne. This is roughly the distance from Quebec City to Toronto.

While the drop in demand for crude oil transport in the early 1980s (noted above) eventually sent a few of these newly constructed behemoths to the scrap-yard, the trend toward jumbo vessels (150,000 to 300,000 DWT) became the norm for bulk freighters in view of the considerable scale economies. Crews on such a structure are the same size as those on a small vessel or even smaller, as many operations on board have been automated or computerized. Furthermore, fuel consumption grows far more slowly than overall capacity.

In addition, this trend toward jumbo ships has been accompanied by significant progress in the ability to load and unload these huge structures. For example, a basin 16.5 m deep at Port Cartier (on the North Shore of the St. Lawrence estuary) can accommodate mineral tankers of up to 160,000 DWT. Loading capacity is 9,000 tonnes per hour for iron ore concentrate and 7,000 tonnes per hour for iron ore pellets (SODES, 1997). Theoretical time required to load a 160,000 DWT vessel, therefore, is 18 hours for concentrate and 23 hours for pellets. Furthermore, in a remarkable innovation, lake freighters have been equipped with a roughly 50 m long metallic arm that supports a conveyor belt connected directly to the hold. Such boats can self-unload at a rate of 6,000 tonnes per hour. This innovation, which can unload a boat up to 50 m from dockside, has been introduced into the ocean shipping industry by Montreal-based Canada Steamship Lines (CSL) and is revolutionizing conditions of delivery by bulk freighters, since it no longer matters what equipment is available at the receiving port. For example, a self-unloading laker can deliver 27,000 tonnes in a few hours. In Sept Iles Bay or Canso Strait in the early 1980s, a half dozen CSL lake freighters transshipped 160,000-165,000 tonnes of dry bulk cargoes (coal, coke, iron ore, grain) into bulk ore carriers, without using any port facilities (Lasserre, 1989). CSL is now offering this service on the east coast of the United States, in western Europe, and in Asia.

As a result of these changes, since the 1950s raw materials have been transported from one continent to another (and even to the ends of the earth) at costs per tonne lower than those to ship the same tonnage a few hundred kilometres by rail. Resources on other continents (even those as far away as Australia) thus become much more attractive economically than those available at home. These improvements in ocean transport only point up the weaknesses of inland transport. In cost-space terms, oceans are very small while continents are huge.

These new phenomena are key to understanding industrialization near deep-water ports and the development of industrial port zones. In Canada (specifically British Columbia and, especially, Quebec), these factors have played a fundamental role (with low-cost hydro-electric power) in decisions to locate a number of aluminum plants, particularly on the banks of the St. Lawrence. They also account for many commercial trade patterns: for example, the low cost per tonne-kilometre of water transport compared with inland transport explains why much of the grain cargo from the Canadian prairies destined for the Mediterranean and Middle East is shipped via Vancouver and the Panama Canal!

2.3 Load Unitization and Size in General Cargoes

By the 1960s, it became clear that the time-honoured makeshift methods for loading and unloading general cargoes would have to go. Two massive crews of dock workers or longshoremen were required, one on the dock, the other on board the vessel, to manipulate cases and objects of all shapes and weights by hand. The first crew loaded a net, which was then moved by a crane from the dock to the ship, or from the ship to the dock; the second removed goods from the net and placed them in the hold (or on a truck or railcar, or in a shed) as best it could. Ships could easily spend as much or even more time in port as they did under way – in the order of a week or two!

As traffic grew and vessels became larger, a stable, standardized load unit was required to mechanize and accelerate loading/unloading operations. Several solutions were proposed and implemented: palletization, big bags, barge carriers, roll-on/roll-off (in which loaded semi-trailers are loaded on board vessels), and containerization, an innovation that quickly took hold on the west coast of the United States in the early 1960s and spread around the world.

The preferred format for containerization is now familiar: goods are placed in metal boxes 6 or 12 m long (i.e., 20 or 40 ft, hence the standard measure TEU, or twenty foot equivalent unit), 2.5 m wide, and 2.5 m high. While these most recent standards have been endorsed by the ISO (International Standards Organization), containers up to 45, 48, and 53 ft in length have appeared. In fact these boxes are intermodal, since they have corner holes allowing them to be fastened to a railcar or truck platform and picked up by an appropriate machine for quick transfer from one mode to another. This innovation is highly attractive, because freight can be expedited without intermediate manipulation from the point of shipment (which could be the end of the assembly line) to the final destination (which could be a supermarket or point of direct consumer sale on another continent). Savings on packaging and insurance costs are possible, therefore, because cargoes are better protected against poor weather and dock theft than they previously were in wood or cardboard cases.

Above all, containerization is a giant step forward for ocean transport, because it completely mechanizes vessel loading/unloading operations and allows the work to be carried out in 24 to 36 hours. In so doing, it increases the productivity of each ship

considerably by increasing the number of annual turnarounds. To be sure, shipping companies must invest heavily: to be completely “cellularized,” a ship needs three sets of containers (one on board and one on each continent). In return, the company is assured that its hold will be almost fully utilized, which was not the case under the old makeshift system. Additional major investment is required for vast wharf areas (on average one kilometre deep), and large gantry cranes to carry out container transshipment under increasingly sophisticated conditions.

This hugely successful container revolution has been another factor in the trend toward jumbo ships. The first container vessels had a capacity of 500 to 1,000 boxes TEU. Today’s structures have a capacity of 6,000 TEU. A new generation with a unit capacity of 8,000 TEU is on the way. Older, smaller vessels have become break-out or feeder vessels to serve other ports on the same continent, collecting containers for intercontinental shipment by the larger vessel at the main port.

The shipping companies’ strategy, therefore, is to select certain ports as hub ports for jumbo ships, and extend the service area by adding feeder or coastal shipping services around the hub port.³ Furthermore, a port receiving large intercontinental container ships becomes a continental entry point to the world of ocean shipping, a gateway between a hinterland and a marine “fore-country,” specifically, all ports of the world regularly served from the port (with the exception of “outer” ports served by feeder services).

This regular service, which primarily transports general cargoes and containers, runs on schedules published (generally) in trade publications. The vessel management regime is totally different from that used for bulk carriers, which are operated either by industrial or commercial firms for private transport (particularly in the oil industry) or for-hire shippers who travel on consignment. Such so-called tramp ships operate on contracts obtained by their owners. The “fore-country” as defined above only includes regular lines that establish continuous links between selected ports.

As ocean-going container ships get larger and larger too, the larger traffic volumes have established an *intercontinental floating bridge* that relies on two types of service: container vessels making regular intercontinental shuttle trips (North America and Western Europe, and the Far East and North America) and vessels that use the Suez and Panama canals to circle the world continuously and regularly, eastward or westward, between these same three continental poles. Other services serve southern continents (Latin America, Africa, and Australia), albeit with reduced frequency for the time being. Shipping worldwide is now organized along these extremely intense links, shadowed by relations in air travel, communications, and financial flows.

Jumbo vessels and massive volumes of ocean traffic have revolutionized the organization of inland transportation.

³ This is a node selected by a transport operator as “pivot” for the network, around which services are reorganized in a radial fashion with easy transfers.

2.4 Consequences of the Ocean Transport Revolution for Continents

Now that major ports receive several high-capacity container ships each day, the same disparity in capacity between ocean and inland transport observed for bulk carriers is apparent for general cargoes as well. Every day, container ships fill the docks with thousands of boxes, which must be taken to the hinterland; at the same time, equivalent volume must be brought in from the hinterland and loaded on vessels within 24 to 36 hours. This monster puzzle must be solved anew every day.

As a result, shipowners have been placing considerable pressure on continental transport systems. In fact, *containerized ocean transport leads inevitably to containerized inland transport*. From this point of view, trucking is the mode least well-equipped to meet the demand, as it cannot increase the capacity of its convoys. Furthermore, highway facilities are often highly congested, particularly in port cities and across major inland urban regions. Therefore, rail networks and rivers (where available) are increasingly called upon to meet this demand, which shipping companies have dispersed in space through the use of feeder services.

Pressure from shipping companies is that much stronger because, for them, the urgency is not just logistical (i.e., establishing inland transport capacities comparable to those available at sea) but, as competition intensifies, financial as well. Specifically, as construction of container ships continues unabated, *competition at sea is very keen and, consequently, rates are very low*. In fact, for years specialists have been saying that rates have hit a level below which competition becomes suicidal for the players. This competition is characterized by two trends: toward ever-larger vessels (in an attempt to obtain the lowest unit costs per box) and *transfer of competition from ocean transport to inland transport through containerization of traffic*, to achieve a new reduction of door-to-door costs and, as a result, a possible advantage over the competition. This explains the extremely heavy pressure on rail and river carriers, who alone are able to accommodate containerized flows through direct transfer between ships and freightliners⁴ or river convoys, thus reducing cost per transported box. Furthermore, in North America (where distances are great) unit costs may be reduced even more through the practice of double-stacking, since rail clearances are greater than those found in Europe.

Freightliners and river convoys serve inland multimodal platforms, which are either river ports or “dry ports” that support container pickup or delivery by rail or truck to the surrounding region. Containerization of sea cargo makes such platforms highly desirable to localities, in that cities having one receive much better service – delivery 24 to 48 hours earlier, and pickup 1 to 2 days later – than those that do not.

Therefore, competition among shipping companies leads to competition between ports and, by extension, between inland cities. Such competition (which is essentially spatial)

⁴ Rail convoys whose units are never detached from one another and that make regular shuttle trips between two points without passing through marshalling yards.

keeps shipping companies constantly on their toes: companies operating fleets of container ships must continuously re-evaluate their decisions and seek out ports that optimize ship travel time, since a reduction of a few hours' travel time translates into several additional trips at the end of the year. This reasoning, for example, led the Cast shipping company to abandon the Port of Antwerp in favour of Zeebrugge, thereby saving one day per trip. Similarly, advertising material for the new container port in Vancouver (Deltaport, next to the ore carrier terminal on Robert's Bank) argues as follows: "...Located 40 km south of Vancouver's inner harbour, Deltaport will save you an hour and 35 minutes sailing time to and from the pilot station. Deltaport is also an hour closer than Seattle, and two hours closer than Tacoma" (*Containerisation International*, 1997).

At the same time, container fleet managers search for the port that is most efficiently organized logistically (i.e., that which minimizes the time required for intermodal transshipment) and charges the lowest rates for its services, while offering the best conditions of access to the hinterland (i.e., optimal containerization conditions, if possible with a choice between several modes to guard against possible work stoppages and guarantee alternative service at reasonable rates). Finally, managers must constantly review market changes in the hinterland, to ensure that the network of inland intermodal terminals adapts to the demand. Managers can only stay on top of things if they engage in constant geographical analysis of the conditions offered by each port.

To summarize, the revolution in ocean transport (for both bulk and general cargoes) has created competition between ports, which has generalized to continents as a whole. Furthermore, the trend toward jumbo ships makes this competition even more fierce, and requires constant investment in port infrastructures (larger basins, deeper drafts, wider access channels, etc.) and superstructures (new gantry cranes for loading/unloading of containers, more powerful devices for transshipment of bulk cargoes). It is therefore necessary to choose between ports for practical reasons, since ports, regions, and national governments have limited resources.

This discussion provides a framework for assessing the position of the St. Lawrence. In particular, it could be argued that any port or port group in which traffic is increasing is in fact winning out over its competitors. The problem is, of course, that this is not quite the case at St. Lawrence ports.

3. STAGNATING TRAFFIC ON THE ST. LAWRENCE

3.1 A Comparative Assessment of North American Gateways

To restate the fundamental question posed at the beginning of this study (which serves as its point of departure): can navigation activities on the St. Lawrence and Great Lakes be a driving force behind economic recovery in Ontario and (especially) Quebec? Unfortunately, an examination of traffic patterns for the St. Lawrence Seaway and St. Lawrence ports indicates that this system has stagnated for a quarter century.

The initial pattern is characterized by a steady decline in tonnage since the late 1970s, from more than 70 MT (million tonnes) in 1977, 1978, and 1979 to 40.9 MT in 1993. While there has since been some recovery, to nearly 50 MT in 1996 (see Figure 2), it is still too early to say whether this recovery will last. Similarly, although St. Lawrence port traffic has picked up slightly since 1993, in the main it has stagnated for a quarter century, particularly at the mid St. Lawrence ports (Montreal, Sorel, Trois Rivières, and Quebec City). Traffic through these ports held steady at about 40 MT throughout this period, while that through the main North Shore ports (Baie Comeau, Port Cartier, and Sept Iles/Pointe Noire) grew from 30 MT to 70 MT in the 1970s, declined between 1980 and 1983, and leveled off at around 50 MT (Figure 18).

This lethargy stands in contrast to the remarkable growth of western Canadian ports, where total traffic has increased from 30 MT in 1970 to an average of 80 MT and over since 1987 (Figure 18). This result is all the more remarkable since these ports are not backed up by an inland water route comparable to the St. Lawrence-Great Lakes system, and must rely on rail and trucking to connect with the hinterland. This makes them vulnerable, as was observed in early 1997 when rail problems in part caused by winter cold immobilized up to 34 ships in port waiting to be loaded, and prevented timely delivery of roughly 1.5 million tonnes of Canadian wheat to Japan (*The Financial Post*, 1997).

These sombre observations with respect to Quebec raise two major questions. First, to what extent can water transportation play a role in long-overdue economic recovery? One reason that Quebec is having difficulty coming out of the current recession (and it is not alone), might be that its fundamental geographical characteristics are not sufficiently taken into account when economic policy is defined and major stakeholders make decisions. Although the St. Lawrence continental gateway is fundamental to Quebec geography, it may not be exploited to its best advantage. On the eve of the 21st century, these concerns are particularly important from the point of view of sustainable development, since water transport (river or ocean) consumes the least energy, and pollutes the atmosphere less per transported tonne-kilometre than any other transport mode.

3.2 Toward a “Gateway” Model

The second question concerns the nature of the St. Lawrence continental “gateway”. In fact, a more theoretical discussion of the very concept of a continental gateway would be appropriate. While this term is used more and more frequently in the literature, definitions (when they exist) do not always agree. It will be useful, therefore, to pin down this concept more precisely.

The world’s great ocean ports draw their strength from a set of characteristics that one could summarize in a sort of reference model, namely a “gateway.” Doing so facilitates comparisons among ports, and identifies the distinctive features of each. This approach is inspired by the “Anyport” model of J. Bird (1963). Neither approach attempts to cast all ports in the same mould, that is, assume that they have the same characteristics or develop in the same way; rather, they simply develop a theoretical reference model for purposes of evaluating actual port groups and assessing the strengths and weaknesses of each.

The characteristics of a gateway can be summarized as follows:

1. A gateway is a port or port group that serves major bulk cargo, general cargo, and container traffic and offers a wide range of port functions, including industries that consume break bulk.
2. A gateway is a port or port group that enjoys connections with the hinterland over at least three or even four modes (truck, rail, river, and gas pipeline). This is what J.-J. Bavoux and J.-B. Charrier, in their 1994 book, call [translation] “complete, efficient, and reasonably priced service”:

Although competition among ports used to occur at the regional level, now continents compete among themselves. Specifically, ... major shipping companies are attempting to concentrate their activities at an ever-smaller number of hub ports. Furthermore, the increased productivity of inland transportation has expanded hinterlands. The essential conditions of success are a system that encompasses many modes, competition between modes that lowers prices, and control of pre- and post-shipping costs.

The authors then make clear that the modes they are in fact discussing are trucking, rail, and river shipping, adding:

Inland water transport allows for scale economies, easy transshipment, and attractive opportunities for temporary storage. Therefore, ports at the mouth of a navigable (or potentially navigable) river have an advantage. (Ibid, p. 21 - quotations are translated)

In particular, as the example of the Rhine demonstrates for the ports of Antwerp and Rotterdam, availability of a major river is a significant asset for shipment of bulk cargoes or containers toward the hinterland: the capacity of inland water transport is generous, unlike the increasingly congested highways and rail links in continental corridors leading out of major ports (Whebell, 1969). Where there is no available river or the river is small, as in Singapore or Hong Kong, coastal shipping is an easy alternative. In such cases, *the hinterland is along the coast*. Many shipping companies use feeder vessels to serve smaller ports on the same continent and generate traffic for their large intercontinental container ships. As described in section 2.3, such gateways act as hubs. Finally, at some ports this coastal feeder service is combined with inland water transport service, which feeds traffic to the large container ships as well.

3. Finally, the downtown area of a gateway contains what A. Vigarié (1991) calls a “multifunctional trading centre” with a well-developed service sector to provide all commercial and banking services required for port operations; vessel and fleet management services (and by extension, inland transport services); stock and commodity exchanges where futures in various commodities are bought and sold; and banks and insurance companies to support all these activities.⁵ Such ports become the driving force behind their respective regional (or even national) economies, while acting as major attraction points for inland traffic flows. An example of this is provided by the recent development of facilities to support transfer of containers between freightliners, river convoys, and container ships.

It is therefore natural to enquire whether the St. Lawrence gateway adheres to this model. Montreal could naturally be viewed, of course, as the gateway to the St. Lawrence River and Great Lakes, a system offering exceptional conditions for inland navigation. Consider the generous clearances, for example: the entire 3,700 km distance from the Gulf of St. Lawrence to the Lakehead is at least 8.20 m deep; furthermore, less than 15 percent of the total distance is made up of channels and canals (which contain only 16 locks). The system can accommodate lake boats, ocean-river ships and seagoing vessels on the order of 27,000 DWT. When this remarkable tool is considered together with the rail and highway networks available from Montreal toward the continental hinterland, the impressive port facilities, and the adjacent downtown business district largely devoted to shipping and other transportation industries, the city does in fact appear to be such a gateway. This impression is confirmed by the continuous growth in container traffic in the port and the intensive communication of all kinds with other gateways around the world, suggesting that Montreal is very much in the game.

⁵ The ideas of several other authors have influenced this theoretical discussion: A. Vigarié and J. Charlier on the development of port triptychs (in which ports are regarded as a hinge between a fore-country and a hinterland); J. Charlier on port systems; and G. Alexandersson on the geography of container ports (see References).

There are two fundamental reasons, however, that Montreal fails to adhere to the gateway model. First, not much volume is handled through the Port of Montreal: the port handles barely 20 MT yearly, far less than most major world ports. Second, as noted above, traffic through Montreal and other St. Lawrence ports has been stagnating: hence, despite tri-modal connections to the hinterland, and unlike most gateways, these ports have not been growing at the expense of their competitors. Therefore, it will be worthwhile to carefully review traffic trends on the St. Lawrence in the last quarter century, and to draw comparisons with the Mississippi (the other major North American river system) and other Canadian and North American port groups. The following questions will be of interest: How do the other North American port groups behave? What competition exists between them? Finally, how should the St. Lawrence gateway (if it exists) be characterized with respect to them?

3.3 Trends in River Traffic

Comparing traffic trends on the St. Lawrence and Mississippi presents something of a challenge. To be sure, the two inland navigation systems are similar in many ways (Figure 1). First, their trunk streams are of comparable lengths (as noted above, the distance from the Gulf of St. Lawrence to the Lakehead at Duluth and Thunder Bay is 3,700 km; it is almost 3,000 km from the Gulf of Mexico to Minneapolis). Second, both systems have capacities that far exceed those of other inland navigation systems: 27,000 DWT for self-propelled vessels on the St. Lawrence and Great Lakes, 22,500 DWT for push-towed barge convoys on the Mississippi between Minneapolis and St. Louis. These capacities may be even greater on many sections of these two systems: lakers confined to the upper four Great Lakes are allowed a unit capacity of 65,000 DWT; seagoing vessels between Quebec City and Montreal are allowed 60,000 DWT, and even 150,000 downstream from Quebec City; and push-towed convoys may carry up to 45,000 DWT downstream from St. Louis, and 67,500 DWT downstream from Vicksburg.

Apart from these few aspects in common, the two inland navigation systems could not be more different. First, the St. Lawrence-Great Lakes system is essentially an inland sea, with (as noted above) minimum draft of 8.20 m over the entire distance; the Mississippi has no lakes or estuary, and is only about 3.50 m deep between Baton Rouge and Cairo, and 2.75 m upriver. Because of the Great Lakes, the St. Lawrence enjoys exceptional hydrologic stability, which is only disturbed below the Ottawa River confluence; the Mississippi, on the other hand, has periods of high and low water that seriously hinder navigation. Finally, two separate fleets, one inland (the lakers), the other inland/seagoing (vessels constructed especially to navigate the ocean and the St. Lawrence-Great Lakes system), coexist *over the whole length* of the St. Lawrence-Great Lakes inland sea; on the Mississippi, by contrast, seagoing vessels are not authorized upriver from Baton Rouge. The remarkable innovation of push-towed convoys was devised in the late 1940s to circumvent the difficult, limited navigation on this system; this innovation was later diffused to inland waterways around the world.

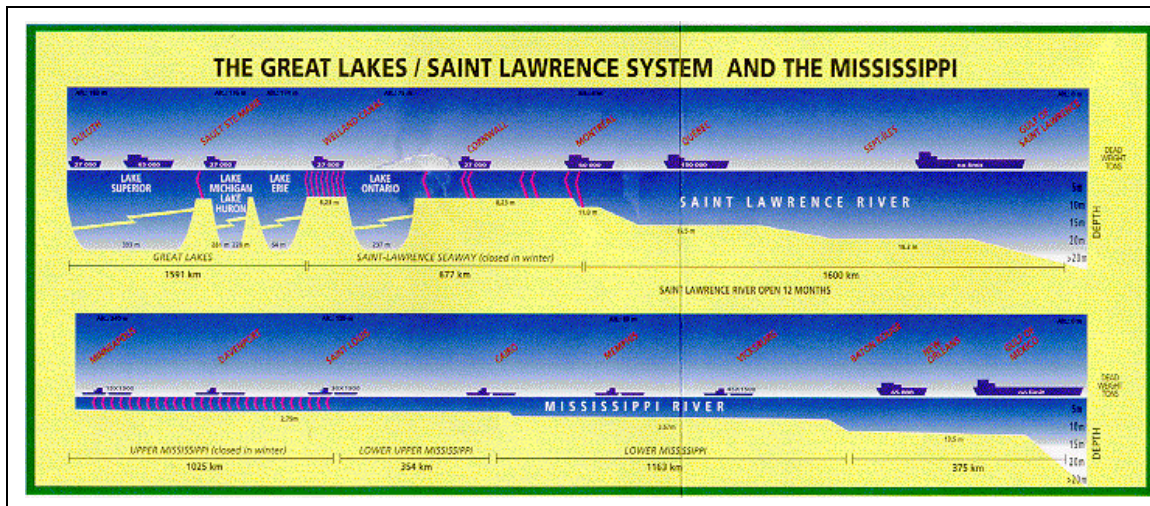


Figure 1 The St. Lawrence and Mississippi systems
(Source: Transport Quebec (n.d.))

Despite these major differences in navigational environment, it is worthwhile to compare major traffic trends on these two systems. Such a comparison is not easy, however, because data are not compiled in the same way for each. Data published by the St. Lawrence Seaway Authority, in co-operation with the St. Lawrence Seaway Development Corporation in the United States, only cover the segment of the system between Montreal and Lake Erie.⁶ (St. Lawrence Seaway Authority, 1995) Otherwise, only port data are available for Canada, from which it is very difficult to reconstruct traffic flows. All data are produced in metric tonnes. For the Mississippi, the Waterborne Commerce Statistics Center of the U.S. Army Corps of Engineers, in New Orleans, publishes detailed statistics for the Mississippi system, the main stream of the Mississippi River, some tributaries such as the Ohio River, and some other segments or spaces. These data, however, are given in 907 kg short tons.⁷ (U.S. Army Corps of Engineers, 1995) Rather than convert all data (and to allow researchers the possibility of comparing results from this study with existing or future official publications), the author decided to leave them as is and simply remind the reader that there is an almost 10 percent margin of error between the two bodies of statistics. To do so does not really hinder understanding in actual fact, because traffic volumes are very different. Major traffic trends and main categories of cargo can still be examined.

⁶ As this report is being written, the most recent report is dated 1995. Cathy Wilson of the SLSA kindly furnished some 1996 data, as well as the figures reproduced here. The author is profoundly grateful to her.

⁷ The most recent such report is 1995. Some data for 1996, as well as for the 1970s and 1980s, were kindly furnished by Susan Hassett and Thomas G. Mire of the Waterborne Commerce Statistics Center in New Orleans. The author thanks them warmly.

3.3.1 Traffic trends on the St. Lawrence

Traffic on the entire Seaway (Figure 2: Montreal-Lake Ontario and Welland Canal sections together, after removal of all duplicate flows) compares two very different periods: although there was remarkable traffic growth between 1960 and the late 1970s, from 1980 to 1996 the dominant trend is a decline in traffic. Upbound and downbound traffic, however, are out of balance. Although the imbalance was more pronounced between 1977 and 1982 when upbound traffic declined sharply, more recently it has tended to rectify itself. In the *Montreal-Lake Ontario segment* (Figure 3), the decline in total traffic began earlier, in 1977; upbound-downbound traffic balance in this segment has been much more favourable to shipping companies, however, except for the period 1978-1983 when flows were unbalanced in favour of upbound traffic. The *Welland Canal* (Figure 4), however, while following the same traffic trend curve, shows far more imbalance between directional flows.

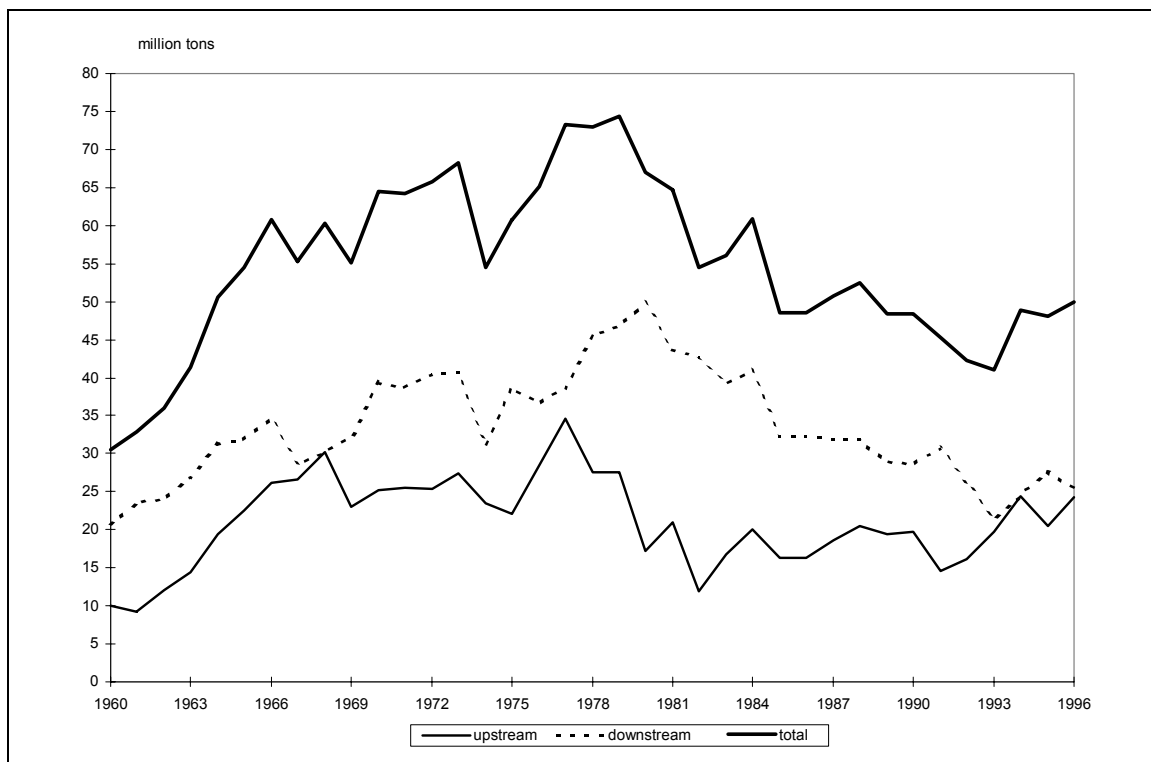


Figure 2 The St. Lawrence Seaway; cargo traffic from 1960 to 1996 (Montreal-Lake Ontario and Welland Canal sections together)

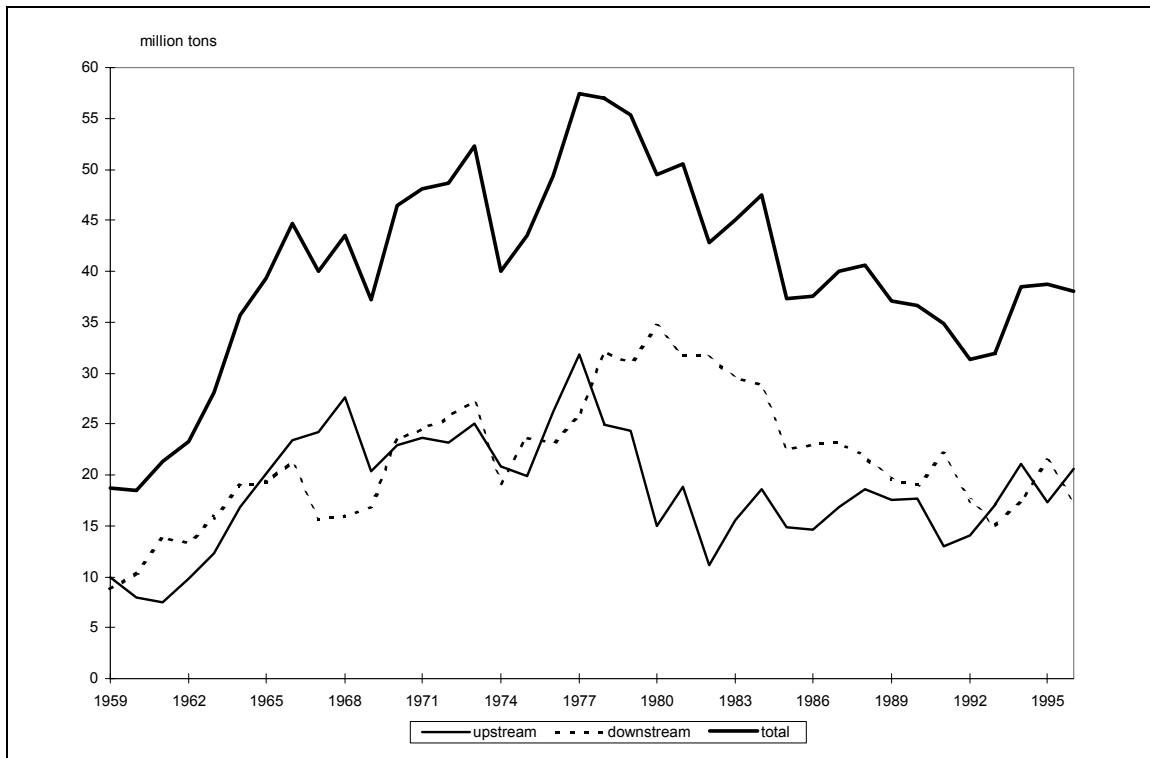


Figure 3 The St. Lawrence Seaway; cargo traffic from 1959 to 1996 (Montreal-Lake Ontario section)

This imbalance can be explained partially through an examination of traffic trends by major transported commodity. *Grain traffic* on both sections (Figure 5 shows data from 1976, because no comparable data are available for previous years) is very close, the small difference no doubt attributable to modest local consumption in the province of Ontario, and possibly by winter diversion to grain silos in Lake Ontario and Upper St. Lawrence ports (particularly at Prescott). More significant, however, is the general decline in traffic after 1978. This decline was particularly drastic in 1984-1985, when the *Western Grain Transportation Act* of 1984 came into effect. This legislation set up a system of subsidies (worth more than one-half billion dollars yearly) for rail transport of grain to West Coast and Great Lakes ports. Subsidies are paid *pro rata to the distance travelled*, which encourages shipments to ports as far as possible from production sites on the Prairies, i.e., Pacific coast ports (Lasserre, 1989). This program justified upgrades to rail capacity through the Rocky Mountains and the construction of modern grain ports at Prince Rupert and Vancouver. By the same token, it accelerated (or aggravated) a reorganization of grain flows initially brought about by geographic trends in the grain market, whose centre of gravity had shifted from Europe and Russia toward Asia: Canadian grain now used West Coast ports to reach the Mediterranean and Africa!

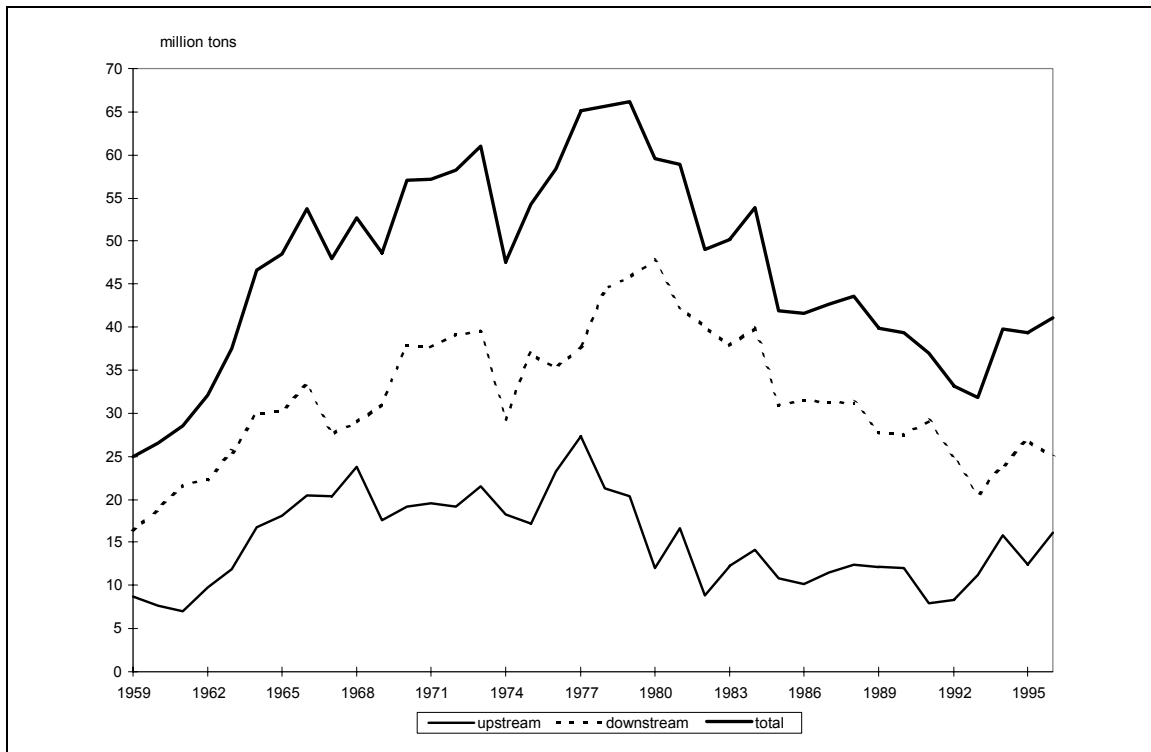


Figure 4 The St. Lawrence Seaway; cargo traffic from 1959 to 1996 (Welland Canal section)

Upbound *iron ore traffic* (Figure 6) has also declined significantly. It started to do so much earlier (from 1978 to 1982) than grain, explaining much of the increased upbound/downbound imbalance already noted for those years. This decrease can be traced to the downturn in the North American steel industry, which marked the beginning of the continental recession in the early 1980s. Although the Welland Canal regularly reported iron ore traffic exceeding that in the Montreal-Lake Ontario segment (where all such traffic is upbound) until the end of the 1970s, this canal also transported iron ore from Lake Superior to steel mills in the Hamilton region, which was fed from two directions (Northern Quebec and Labrador, and the Mesabi Range). After 1982, however, iron ore traffic on the Montreal-Lake Ontario segment was always greater than that through the Welland Canal: American steel plants around the Great Lakes, after reorganization, receive most of their ore from Lake Superior, while Canadian plants receive most of theirs from Northern Quebec and Labrador (Lasserre, 1989). In 1996, therefore, downbound ore traffic on the Welland Canal was only 0.9 MT, while upbound ore traffic in the Montreal-Lake Ontario segment was 5.1 MT to the United States and 5.6 MT to Canadian steel plants at Hamilton, on Lake Ontario, and Nanticoke, on Lake Erie (St. Lawrence Seaway Authority, 1995). The other most significant trend, which is apparent from Figures 2 to 6, is that *for the most part, traffic declines on the St. Lawrence are related in time to the decline in iron ore initially (1978-1982) and to the decline in grain later on (primarily after 1984).*



Figure 5 The St. Lawrence Seaway; grain traffic from 1976 to 1996

Otherwise, *coal traffic* is very different on the Welland Canal and the Montreal-Lake Ontario segment (Figure 7). Such traffic is relatively heavy on the Welland Canal (although it did decline between 1969 and 1993). Most traffic is American soft coal bound for steel plants and thermal power plants on the shores of Lake Ontario, although a small part continues down the St. Lawrence for export either through transshipment (most often direct, using self-unloading lake freighters to load ocean-going ore freighters on the North Shore of the estuary) or through topping off on jumbo ships for which American east coast ports are not deep enough and that pick up extra cargo in (most often) the Canso Strait, again from self-unloading lake freighters. These flows of coal, in conjunction with upstream grain movements, contribute to the directional flow imbalance already noted for the Welland Canal and all Seaway traffic (Figures 2 and 4).

Furthermore, *general cargo traffic* (according to the Tariff of Tolls, Figure 8) appears to be cyclic, ranging between 2 MT and 8 MT from year to year. It includes a respectable volume of steel ingots and steel plate imported by Great Lakes steel plants, as well as a few tens of thousands of tonnes annually of containers, which are categorized separately (St. Lawrence Seaway Authority, 1995). It is interesting to compare this traffic to that on the Mississippi.

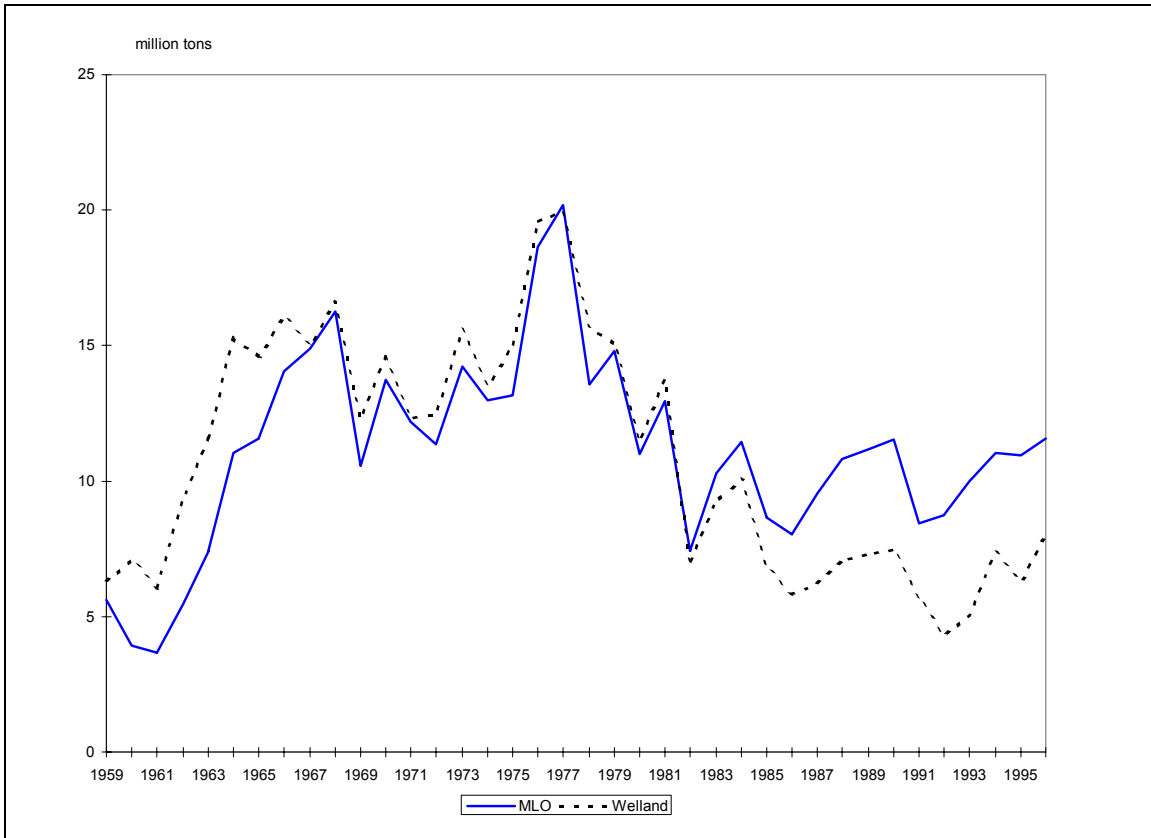


Figure 6 The St. Lawrence Seaway; iron ore traffic from 1959 to 1996

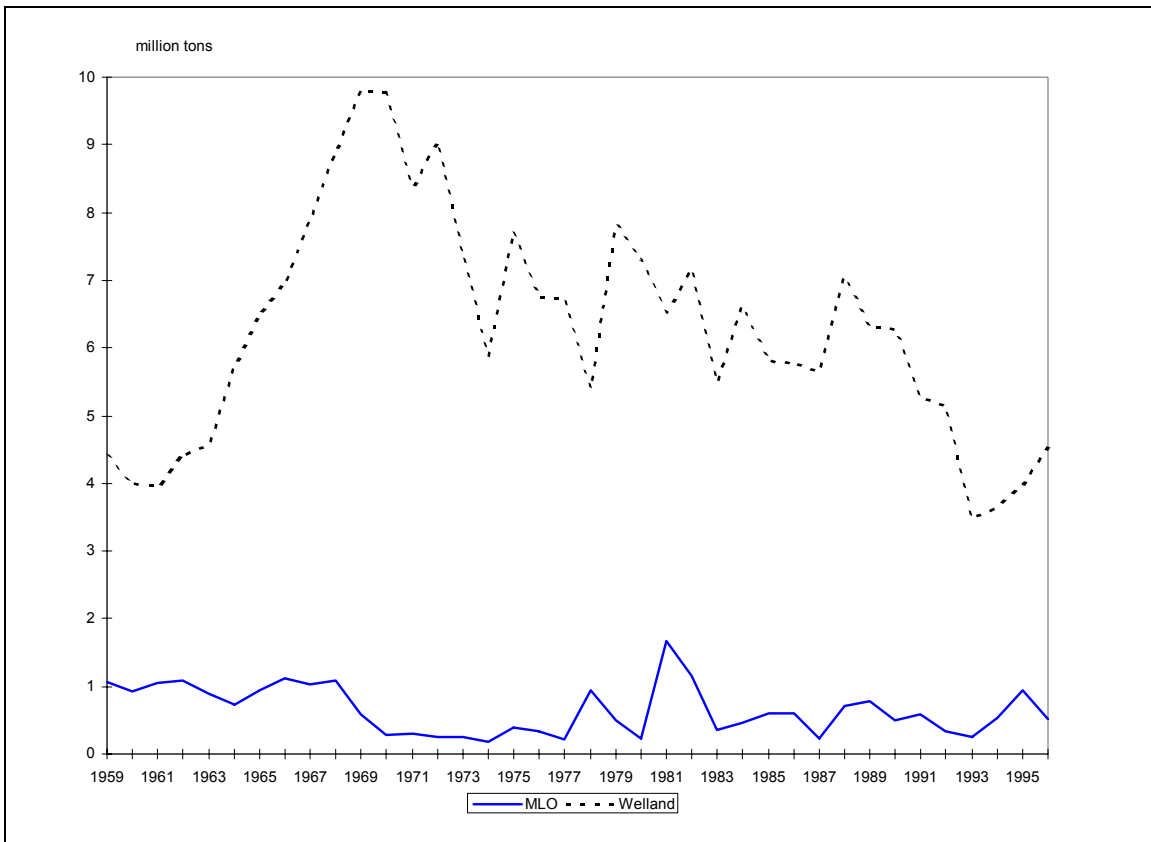


Figure 7 The St. Lawrence Seaway; coal traffic from 1959 to 1996

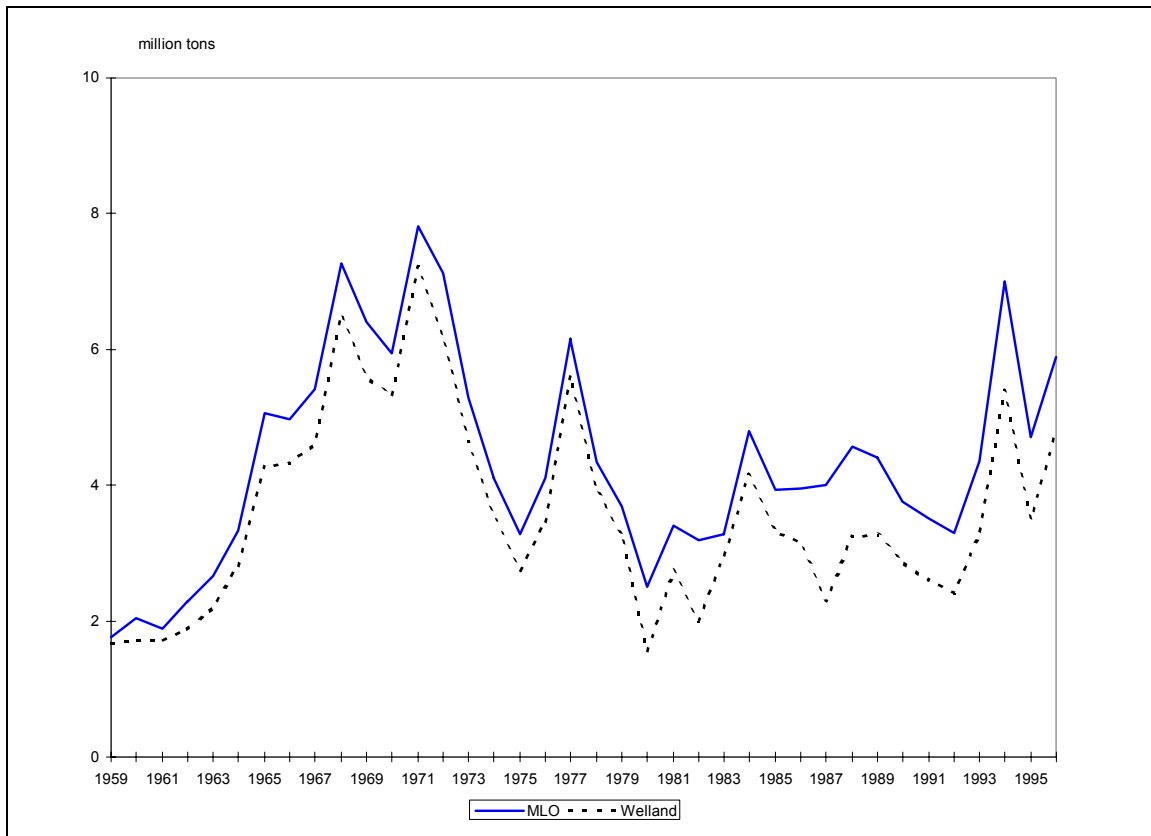


Figure 8 The St. Lawrence Seaway; general cargo traffic from 1959 to 1996

3.3.2 Traffic trends on the Mississippi

Waterborne Commerce of the United States (U.S. Army Corps of Engineers, 1995) contains data that illustrate a number of characteristics of Mississippi traffic, as compared with St. Lawrence traffic (Figures 9 to 14):

- Even though these data are exaggerated by nearly 10 percent because they are expressed in short tons of 907 kg, *traffic is massive*, increasing between 1975 and 1994 from 450 MST to nearly 700 MST on the entire Mississippi system, from 300 MST to 500 MST on the main stream between Minneapolis and the Gulf of Mexico, and from 170 MST to 270 MST on the Ohio River. While it could be argued that the population of the United States is ten times greater than that of Canada, the St. Lawrence serves the American portion of the Great Lakes region as well. On the other hand, Seaway data only apply to a *segment* of the St. Lawrence-Great Lakes system (between Montreal and Lake Erie) while American statistics cover the *entire* Mississippi river system;

- Another striking characteristic of this traffic is the *almost constant upward trend*. There were only four years between 1975 and 1994 when shipments declined (between 1982 and 1985 on the entire Mississippi system and on the main stream, and between 1979 and 1983 on the Ohio River). Even then, decline in these four years is far less apparent for internal traffic⁸ on the entire Mississippi system (Figures 9 and 11) and the main stream of this river (Figure 12).
- There was an increase in export traffic⁹ on the entire Mississippi system (Figures 9 to 11) and on its main stream (Figures 12 and 13), corresponding partly to the increase in agricultural product flows. Coal traffic, largely from the Ohio River (Figure 14) and the Port of Pittsburgh (the largest inland American port, with traffic of 49 MST in 1994 (U.S. Army Corps of Engineers, 1995)) increased as well, while petroleum product movements declined significantly between 1979 and 1985.
- Finally, traffic on another American waterway, the Gulf Intracoastal Waterway, has increased since 1982, sustained by increased flows in petroleum products and chemicals (Figure 15), while Great Lakes traffic (Figures 16 and 17) as recorded by the Americans, after dropping significantly between 1980 and 1982, appeared to recover somewhat after this date as shipments of crude materials (particularly iron ore) increased. Since this involved primarily “lakewise” traffic,¹⁰ the recovery appears to be real. In this regard, the reorganization of the American steel industry on the Great Lakes involves a national geographic reorientation in favour of American supply and transport networks at the expense of Canadian sources. There was a similar dip in export traffic (including grain shipped to Canadian St. Lawrence ports) as well as stagnant coal flows that contrast sharply with results from the Mississippi system.

Traffic has grown so much that the Army Corps of Engineers has been authorized to plan a *new generation of locks* between St. Louis and Minneapolis, to accommodate longer push-towed convoys (Lake, Schwier, English, Ghonima, Hackston, 1995). As noted above, *competition is continental*, between river systems associated with gateways, and between inland water transport and railways. In fact, some authors claim that clearances in the St. Lawrence-Great Lakes system may be inadequate in the medium term (Heads, Wilson, Hackston, Lake, 1996). Fortunately, the St. Lawrence and Welland Canal facilities were designed for a possible backup of existing locks by new

⁸ *Waterborne Commerce of the United States* defined *internal traffic* as follows: “Vessel movements (origin and destination) which take place solely on inland waterways” and *coastwise traffic* as follows: “Domestic traffic receiving a carriage over the ocean, or the Gulf of Mexico (e.g., New Orleans to Baltimore, New York to Puerto Rico, San Francisco to Hawaii, Alaska to Hawaii). Traffic between Great Lakes ports and seacoast ports, when having a carriage over the ocean, is also termed Coastwise” (*Op cit*).

⁹ The same source defines *exports* as follows: “Outbound domestic merchandise and re-export of foreign merchandise from a U.S. foreign trade zone destined for foreign countries” (*Op cit*).

¹⁰ The same source defines *lakewise* traffic as: “Waterborne traffic between the United States ports on the Great Lakes system” (*Op cit*).

structures with greater clearance. Considering that Minneapolis is the same distance from central Saskatchewan as Thunder Bay, there is even greater cause for concern.

Comparison of inland traffic on the St. Lawrence and Mississippi, therefore, suggests two distinct situations, each of which at least partly reflects the economies of the two countries, but that could lead to divergent policies. Let us now turn to traffic trends at ocean ports.

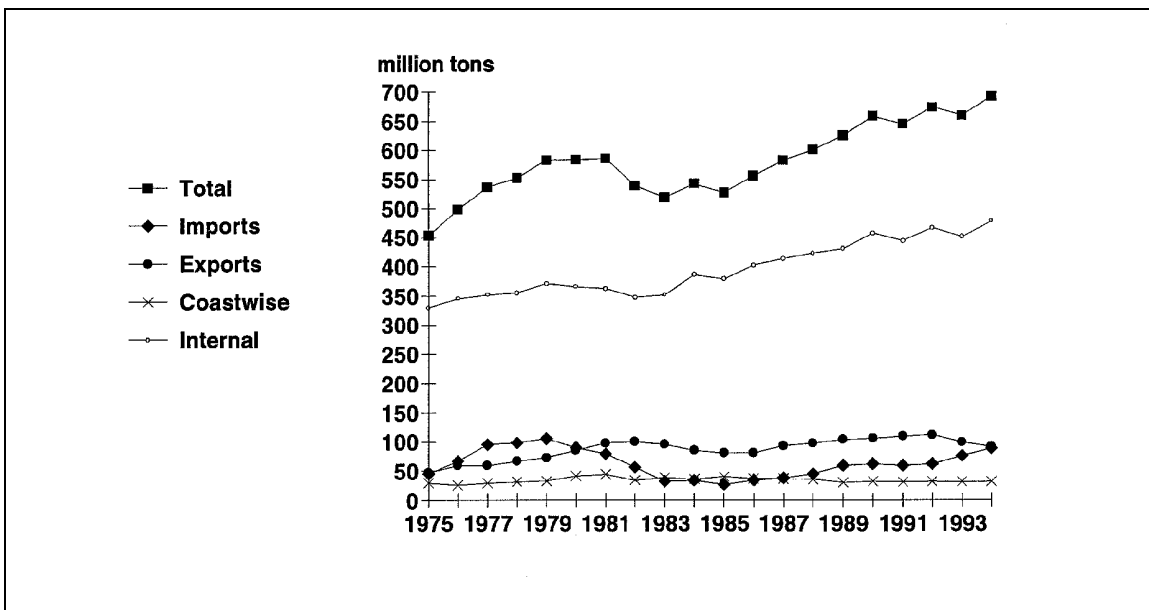


Figure 9 The Mississippi system, traffic trends, 1975-1994, in million short tons
(Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

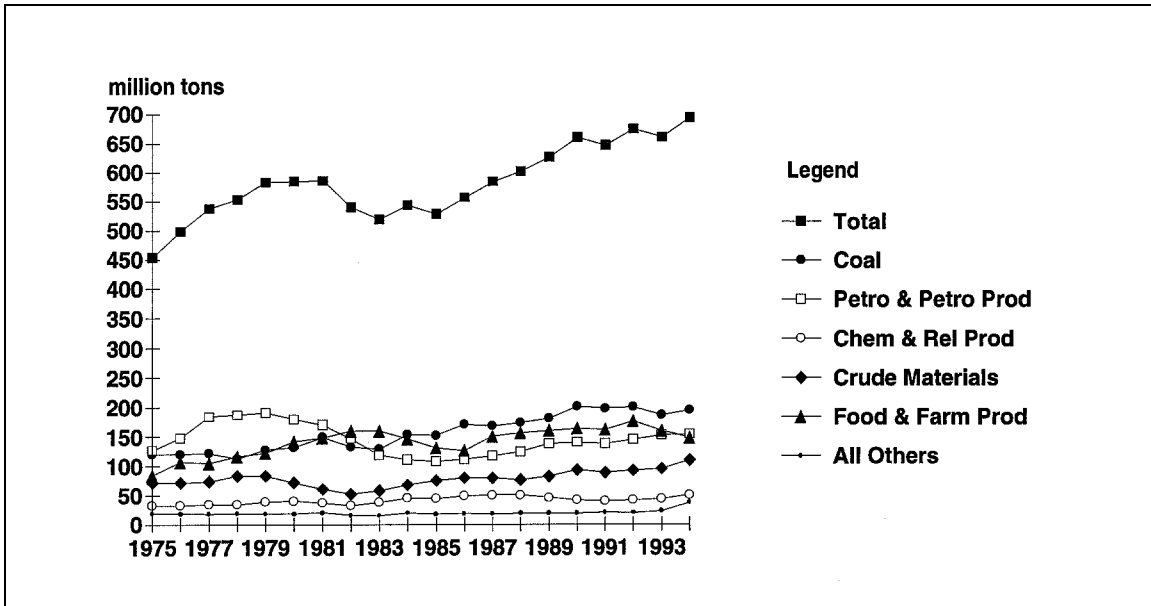


Figure 10 The Mississippi system, traffic trends by freight type, 1975-1994, in million short tons (Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

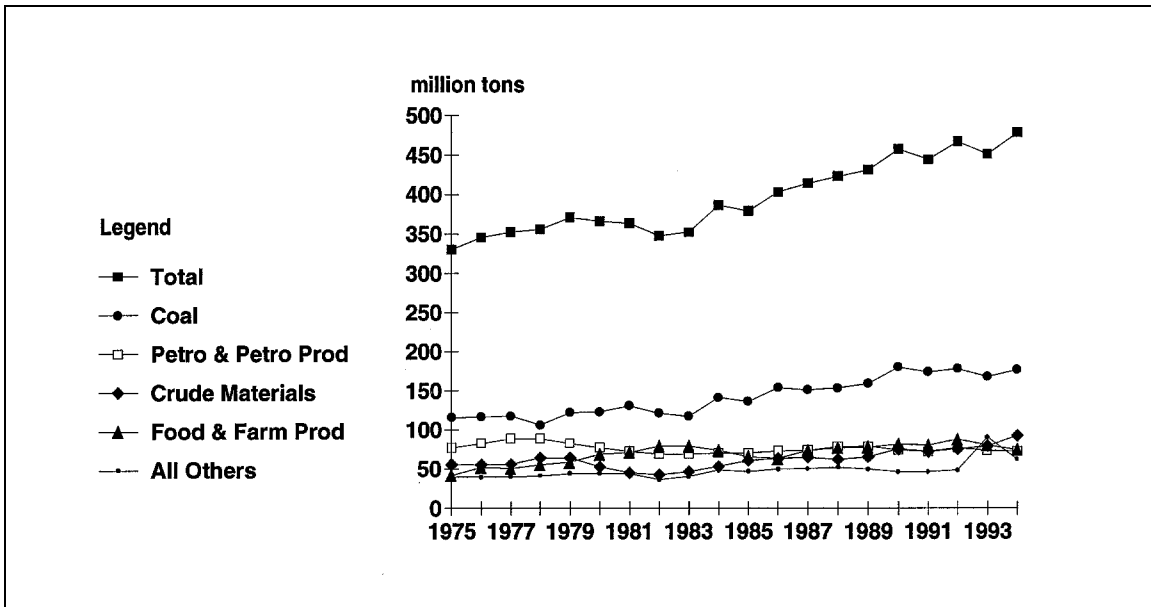


Figure 11 The Mississippi system, traffic trends of river traffic (internal) by freight type, 1975-1994, in million short tons (Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

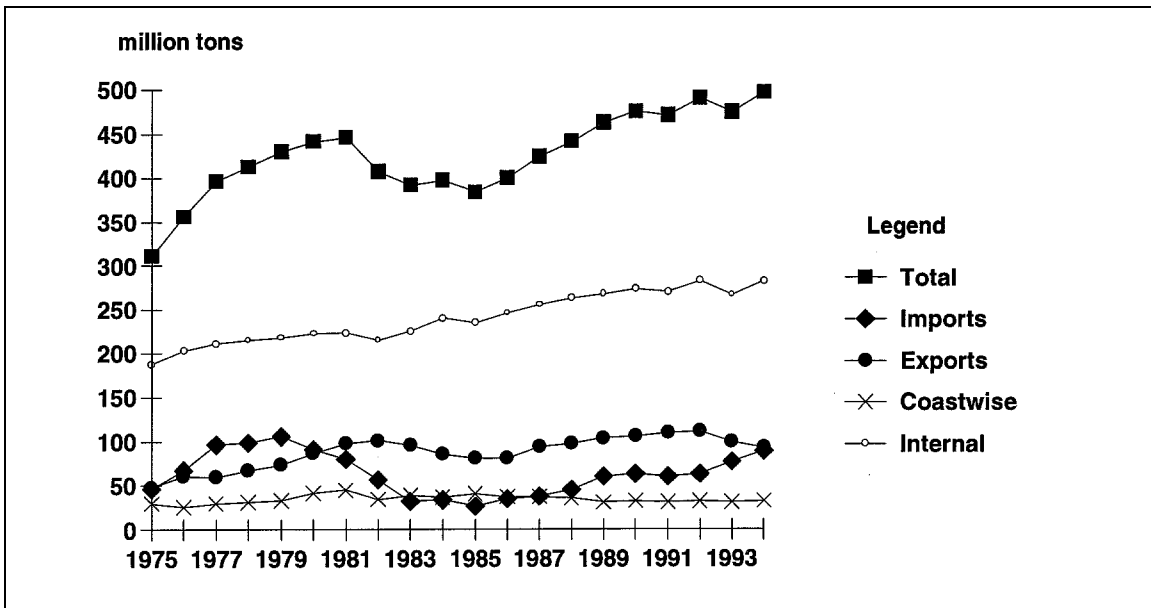


Figure 12 Main stream of the Mississippi, traffic trends, 1975-1994, in million short tons
 (Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

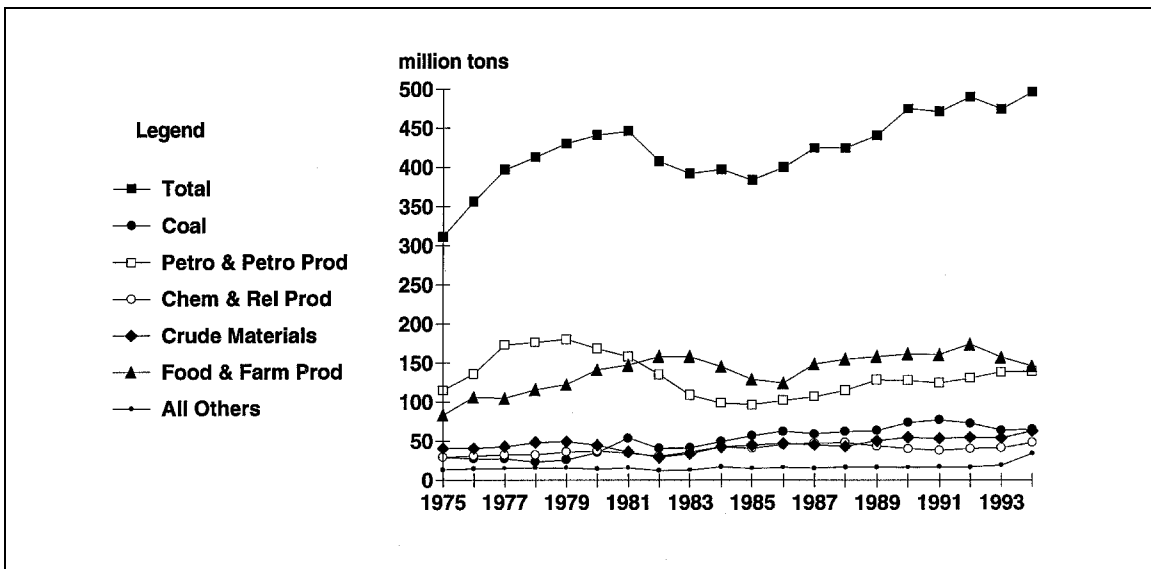


Figure 13 Main stream of the Mississippi, traffic trends by freight type, 1975-1994, in million short tons
 (Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

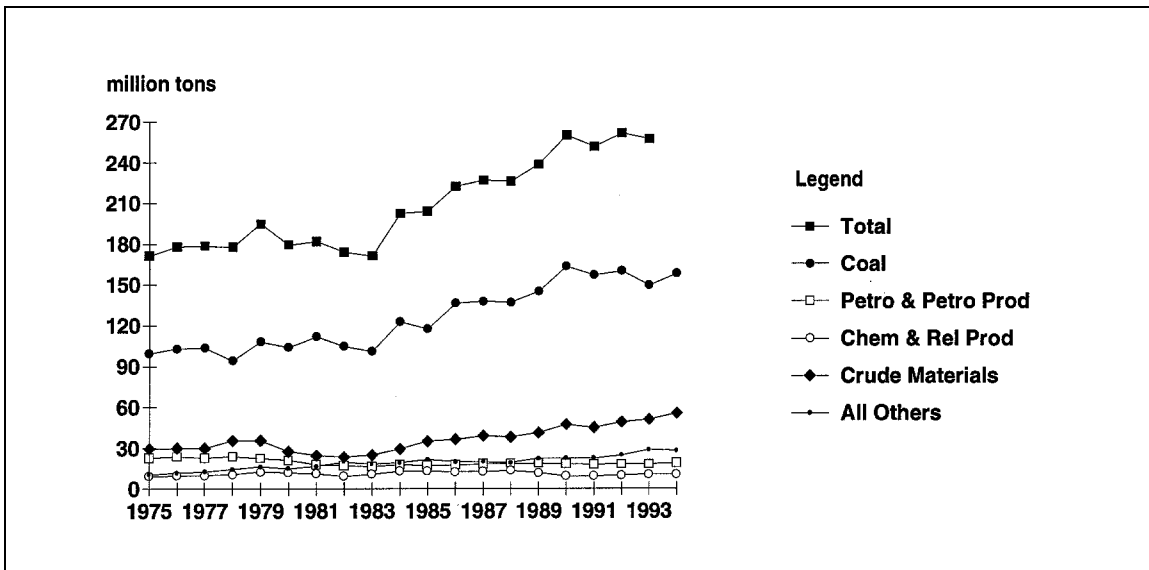


Figure 14 Traffic trends on the Ohio River, 1975-1994, by freight type, in million short tons
(Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

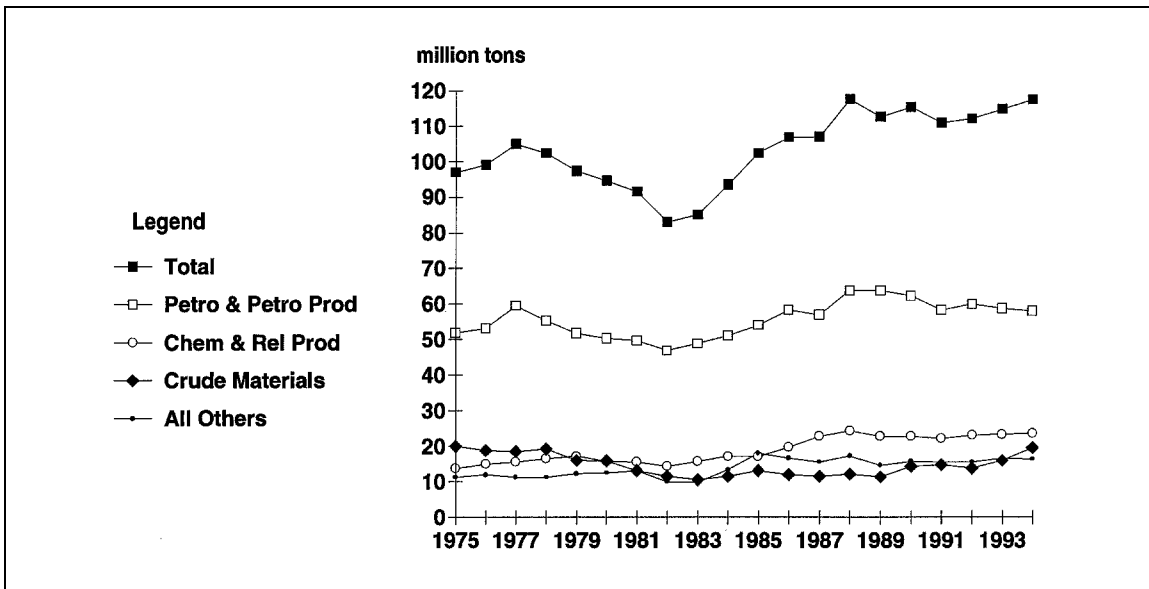


Figure 15 Traffic trends on the Gulf Intracoastal Waterway, 1975-1994, by freight type, in million short tons
(Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

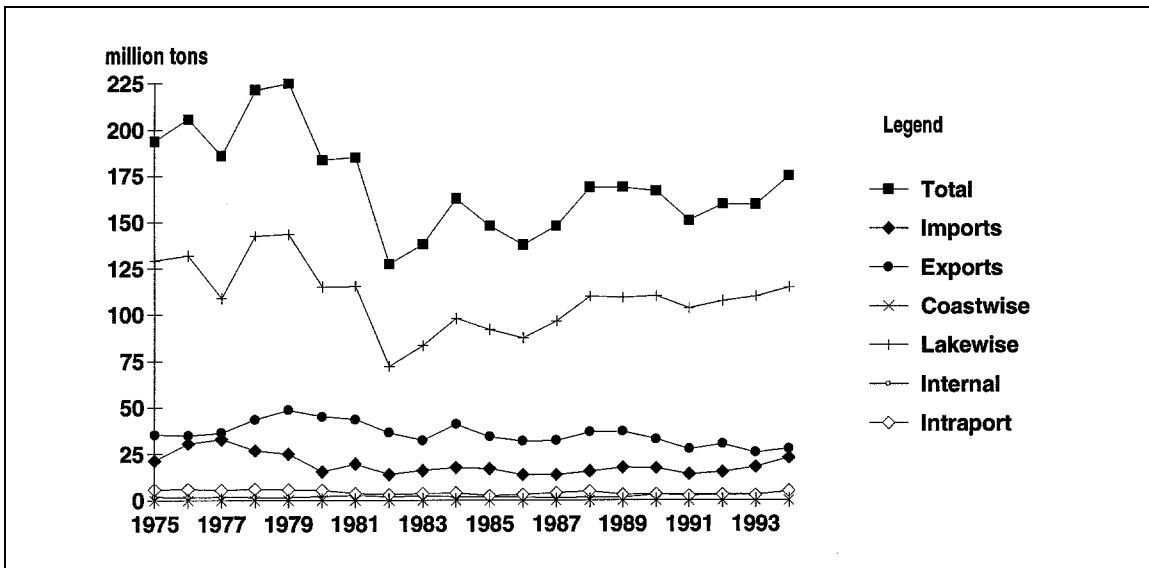


Figure 16 U.S. traffic trends on the Great Lakes, 1975-1994, in million short tons
(Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

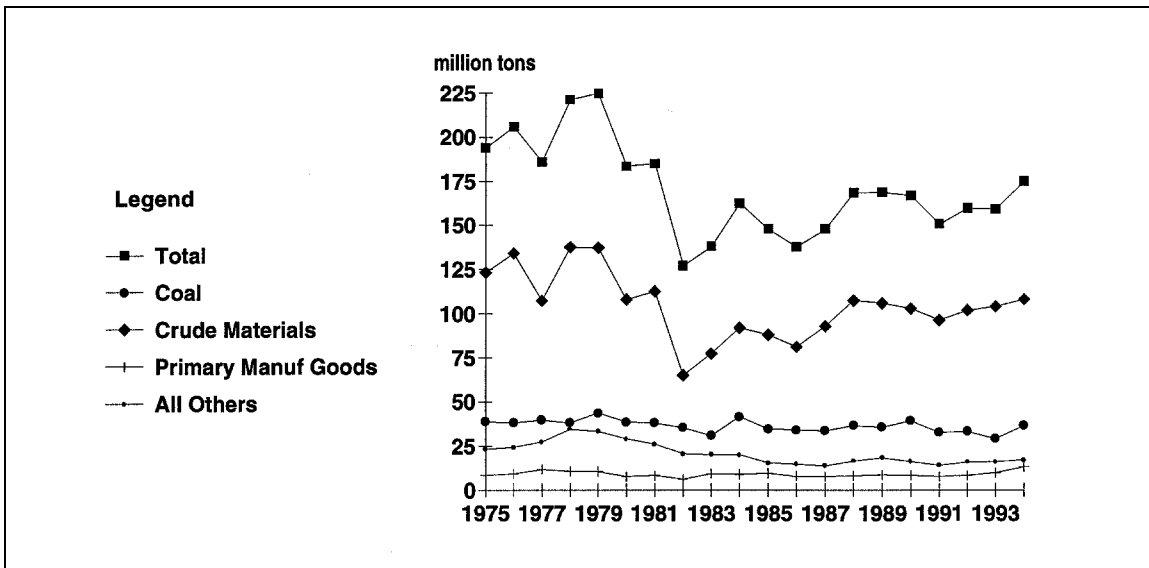


Figure 17 U.S. traffic trends on the Great Lakes, 1975-1994, by freight type, in million short tons
(Source: *Waterborne Commerce of the United States*, Part 5, Section 3)

3.4 Traffic Trends at Ocean Ports

Here again, a comparative approach is very revealing. The units of analysis are *port groups* that, considered as a whole, could act as gateways, that is, interfaces between ocean navigation and the continental hinterland. This analysis groups ports that handled at least several million tonnes annually over the study period (1970-1995) and are either close to one another geographically (e.g., Long Beach and Los Angeles), situated on the same river (e.g., New Jersey and Pennsylvania ports along the Delaware River), or similar in major function (e.g., Prince Rupert and Vancouver, which both export Canadian grain). Trends in port traffic are examined separately for Canada and the United States, largely because the data come from different sources.

3.4.1 Traffic trends at Canadian port groups

The St. Lawrence continental gateway is something of an exception to the principles just outlined. First, it is the central focus of this study; second (and above all), four of the seven St. Lawrence ports selected for study are in the mid St. Lawrence (Montreal/Contrecoeur, Sorel, Trois Rivières, and Quebec City/Lévis) while three are on the North Shore of the St. Lawrence estuary (Baie Comeau, Port Cartier, Sept Iles/Pointe Noire). The North Shore ports are noteworthy in many ways. First, they have very specialized functions: transshipment of grain, supply to aluminum plants and shipment of processed goods (which they share with other St. Lawrence ports) as well as handling of iron ore from Northern Quebec and Labrador. Second, they are the only ports among the North American ports studied that *carry out their functions with a single mode of transport – water – toward the continental hinterland*, because they have no direct access to the North American rail or highway networks. In other words, *these ports operate as if they were on an island* from the point of view of organization of flows, and consequently cannot act as gateways in the same way as the others.

This way of proceeding has its limitations, however. The Statistics Canada figures¹¹ used throughout the study period provide a slightly simplified view of traffic in the St. Lawrence gateway, because three ports handling smaller traffic loads are not included;¹² consequently, the St. Lawrence continental gateway is illustrated in Figure 18 using two curves instead of one. The contrasts between these two curves, however, are interesting in themselves. As indicated in the introduction, the mid St. Lawrence ports (Montreal, Sorel, Trois Rivières, and Quebec City) handled about 40 MT of traffic throughout this period, while the North Shore ports (Baie Comeau, Port Cartier, Sept Iles/Pointe Noire) grew in the 1970s and, after a brief decline in 1980-1983, stabilized at

¹¹ The *Canada Yearbook* for the 1970s and early 1980s (figures given in 907 kg short tonnes for 1970-1975 were converted) and the annual *Shipping in Canada* report for 1986-1995.

¹² These are Bécancour (1.2 MT in 1995), a port linked to an industrial park, which could be considered with mid St. Lawrence ports; and Port Alfred and Havre St Pierre (3.2 MT and 2.5 MT, respectively, in 1995), which do not contribute to gateway traffic (the first is on the Saguenay and serves local industries, and the second loads titanic iron ore for processing in the region of Sorel, whose figures take account of this traffic).

about 50 MT. When the two subgroups are considered together, the St. Lawrence ports have stood at about the same level as the Pacific ports since the late 1980s – except that St. Lawrence traffic is stagnant.

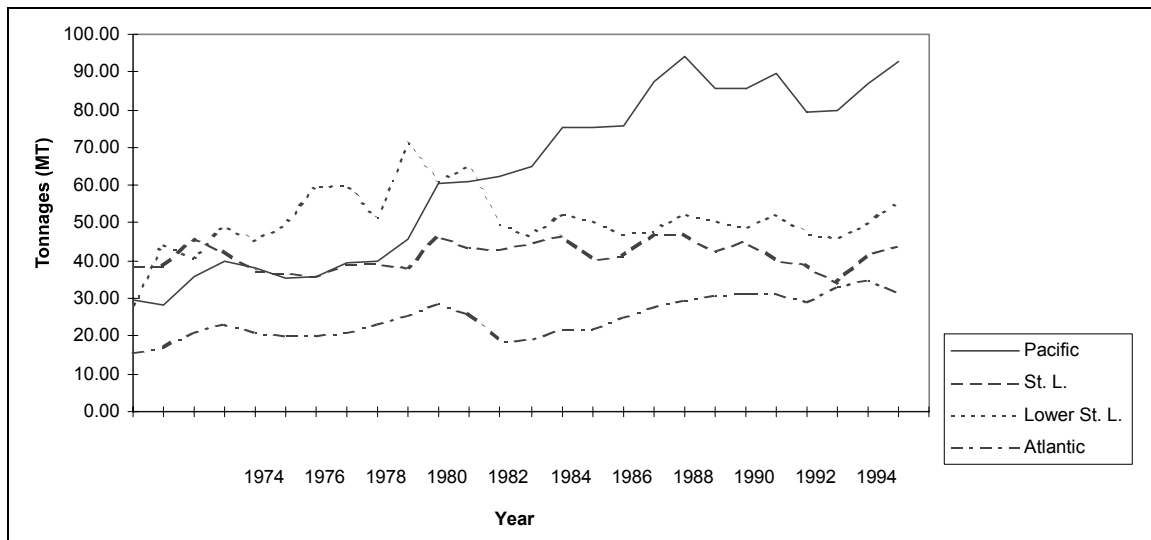


Figure 18 Major Canadian port groups, traffic trends, 1970-1995

Pacific ports, on the other hand, have reported significant growth, from 30 MT in 1970 to about 90 MT in recent years. The curve was obtained by combining traffic for Vancouver, New Westminster, the Fraser River docks, and Prince Rupert. This remarkable success can be explained by the expansion of Asian markets and (as was discussed above) by the transfer of part of Canadian grain exports from eastern to western Canadian ports.

This striking contrast is complemented by another, which is just as significant if more modest. Atlantic ports (Halifax and Saint John, N.B.) reported increases in this period that were smaller than those of Pacific ports, but significant when compared with St. Lawrence ports because their traffic has doubled in 25 years.

These contrasts in tonnage growth should be interpreted in conjunction with the value of handled cargoes. Although Statistics Canada unfortunately publishes no data in this regard, valuable information may be gleaned by examining container traffic (Statistics Canada, 1994 and 1995). The ports of Montreal, Vancouver, and Halifax alone handled 93.7 percent of Canadian container cargo in 1995: 7.2 MT in Montreal, 4.5 MT in Vancouver and 3.7 MT in Halifax (Statistics Canada, 1995). Montreal has always been the leader in the containerized freight segment; Halifax was second until 1990, but was overtaken by Vancouver in 1991 (Figure 19). In this regard, the St. Lawrence performs one of the major functions in the gateway model.

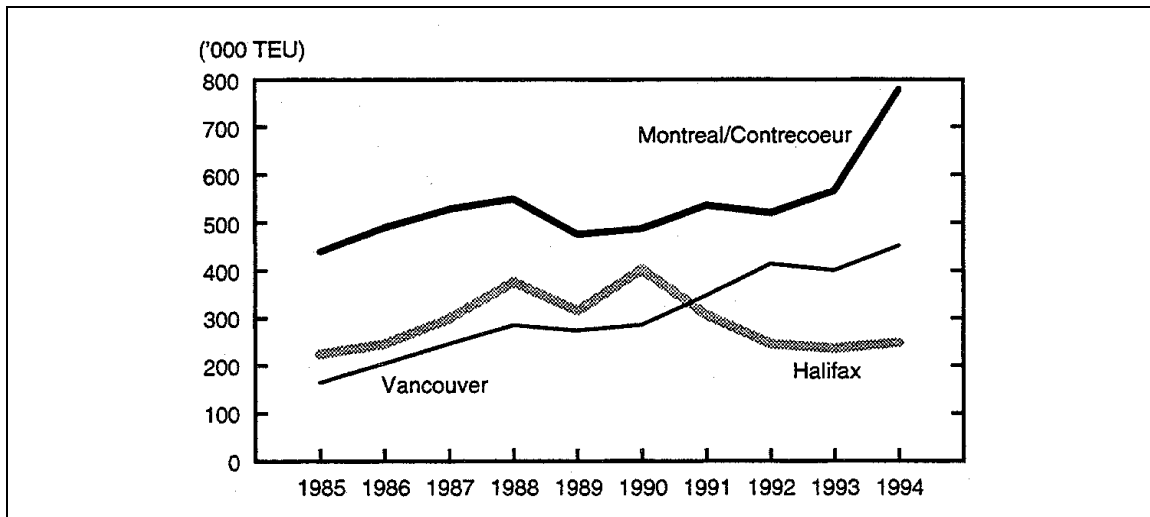


Figure 19 Containerized freight trends in Canada's three major ports for this type of traffic, 1985-1994, in thousands TEU
(Source: Statistics Canada, *Shipping in Canada*, 1994, p. 24)

We will now look for similar contrasts among American ports.

3.4.2 Traffic trends at American port groups

Waterborne Commerce of the United States contains a wealth of information.¹³ Fortunately, traffic data are reported by state (U.S. Army Corps of Engineers, 1995), albeit for ocean-going and inland traffic combined. For example, out of total traffic of 2,214.8 MST in 1994, Louisiana was first with 477.3 MST.¹⁴ Traffic in the 150 largest American (ocean and inland) ports is also listed, in alphabetical order and by rank in total tonnage, broken down by international (export and import) and domestic traffic.¹⁵ These data were used to examine the four major geographical groups: the Upper Atlantic Seaboard, the South Atlantic Coast, the Gulf of Mexico, and the Pacific Coast. A number of ports are discussed separately, either because of their size (e.g., New York, which is in fact a port group in itself, and Houston) or because there is no other port nearby (e.g., Baltimore). Other ports have been grouped because they lie along the same river (e.g., the Delaware River, as noted above).

¹³ U.S. Army Corps of Engineers, *Waterborne Commerce of the United States*, published annually in 5 volumes, as well as a number of other publications (including such CD-ROMs as the United States Waterway Data CD-ROM.) See also U.S. Army Corps of Engineers, *Navigation Centre User's Guide*, NDC Report 96-3, June 1996, 27 pp. with many appendices.

¹⁴ *Ibid*, Calendar Year 1994, Part 5, Table 4-2.

¹⁵ *Ibid*, Part 5, Tables 5-1 and 5-2 for 1990 and later, Table 3 for 1970-1989.

Traffic through major port groups on the Upper Atlantic Seaboard (Figure 20) is in decline at all ports. The drop in traffic through New York has been pronounced (although many people may not realize this). For other ports, the decline is more gradual. For example, traffic declined fairly steeply through the Delaware River ports (Paulsboro and Camden, New Jersey; Philadelphia and Marcus Hook, Pennsylvania; Newcastle and Wilmington, Delaware) between 1980 and 1983; traffic recovered somewhat after that, but not to its former levels. Baltimore and the three major New England ports (Boston, Massachusetts; Providence, Rhode Island; and New Haven, Connecticut) also declined modestly, no doubt because of parallel declines in heavy industry in their respective regions.

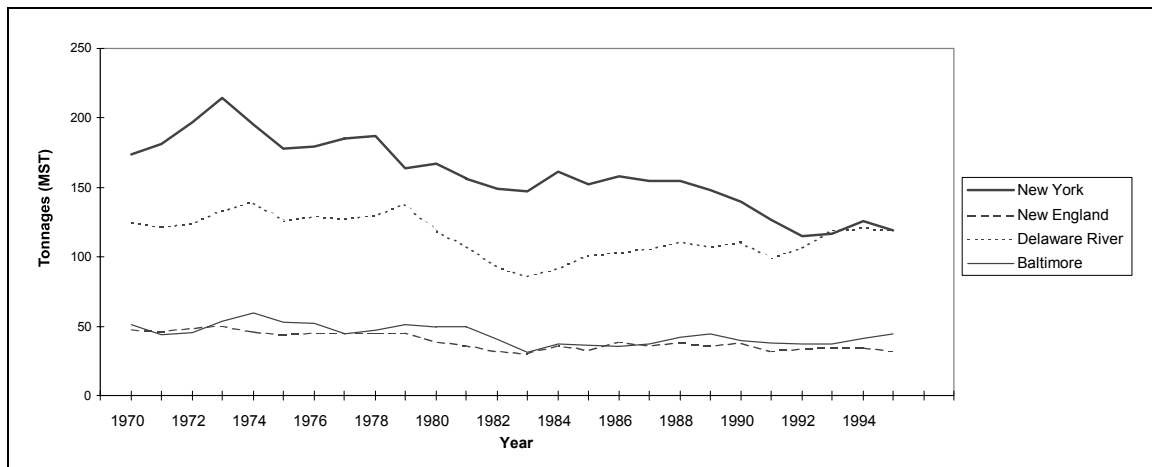


Figure 20 Major port groups, traffic trends, 1970-1995

Traffic through South Atlantic Coast ports (Figure 21) looks somewhat different. Variations in traffic through these ports over time should be interpreted cautiously, since traffic through these ports is modest by American standards, certainly when compared with the Upper Atlantic Seaboard. Traffic (primarily coal) through the Port of Norfolk, Virginia, varied widely, with no apparent trend. On the other hand, traffic through Newport News, Virginia, varied similarly over time but with more of a positive trend. The same was true for the two other port groups: the Carolinas and Georgia (including Morehead City and Wilmington, North Carolina; Charleston, South Carolina; and Savannah, Georgia) and the Florida Atlantic Coast (Miami, Port Everglades, and Jacksonville). The modest traffic levels at these ports suggest that their role is more regional than continental. In fact, some of these ports (such as Savannah and Charleston) handle considerable general cargo and container traffic. For example, Charleston handled 11.1 MST of general cargo in 1996, and 1,078,000 TEU in container movements, provided from regular shipping lines serving the Far East (*Journal of Commerce*, 30 January 1997).

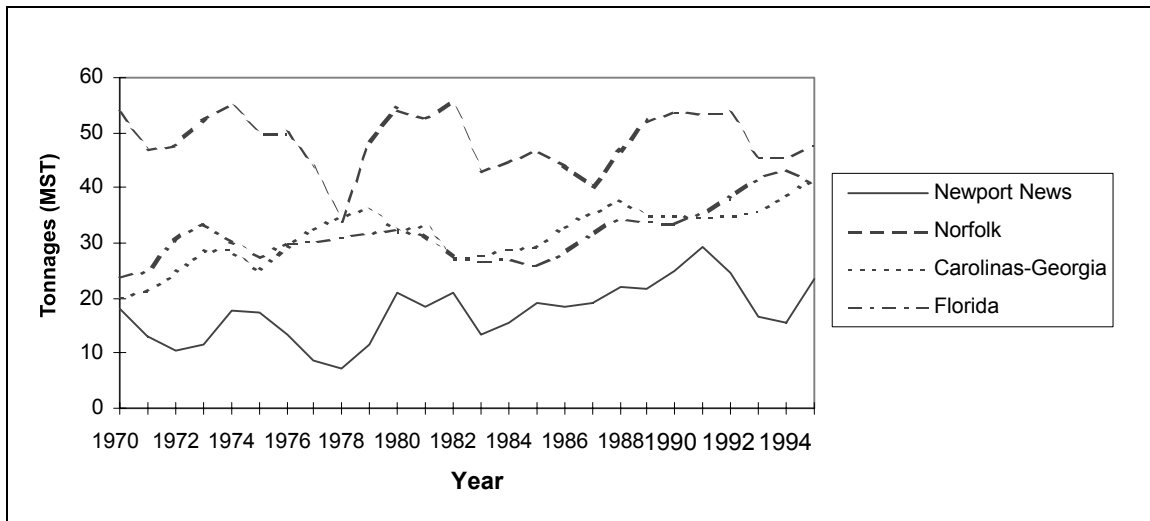


Figure 21 Major port groups on the South Atlantic Coast, traffic trends, 1970-1995

Traffic trends for Gulf of Mexico port groups are on a completely different scale (Figure 22). Apart from a decline of a few years' duration in the early 1980s, traffic through all groups has grown (while growth was modest for Tampa, Florida; Mobile, Alabama; and Lake Charles, Louisiana). Other port groups grew more quickly. Between 1970 and 1995, for example, traffic through Houston grew from 64.6 to 135.2 MST; traffic through other Texas ports grew from 100.5 to 211.3 MST. Mississippi delta traffic has exceeded 400 MST since 1992, and reached 438 MST in 1995. Here, however, the data in *Waterborne Commerce of the United States* contain an anomaly. Until 1989, this traffic was counted using the old customs limits for two ports, Baton Rouge (miles 168 to 253) and New Orleans (miles 0 to 127). Beginning in 1990, statistics are reported for four ports along the Mississippi, using boundaries recognized by the State of Louisiana: Plaquemine (miles 0 to 81.2), New Orleans (81.2 to 114.9), South Louisiana (114.9 to 168.5) and Baton Rouge (168.5 to 253; see Figure 23). Consequently, the old structure contained a 41-mile "hole"; furthermore, data published after 1990 report figures from a "new" port that not only existed already, but placed first among American ports in traffic volume (184.8 MST in 1994 and 204.5 MST in 1995)!¹⁶ The curve for Mississippi ports between 1970 and 1989, therefore, almost certainly lies below the real curve. *These ports form the primary American port group in traffic volume, which has been growing*

¹⁶ Many thanks to Susan Hassett, who provided documents explaining these changes.

steadily since 1985. In fact, they make up an almost uninterrupted 400 km band of port facilities (Figure 24),¹⁷ yet another phenomenon that deserves further study.

Finally, traffic at Pacific Coast port groups (Figure 25) generally shows steady growth. This is particularly true for the group made up of Long Beach and Los Angeles, but applies equally well to port groups at Portland, Oregon; Seattle-Tacoma, Washington; and San Francisco-Richmond-Oakland, California.

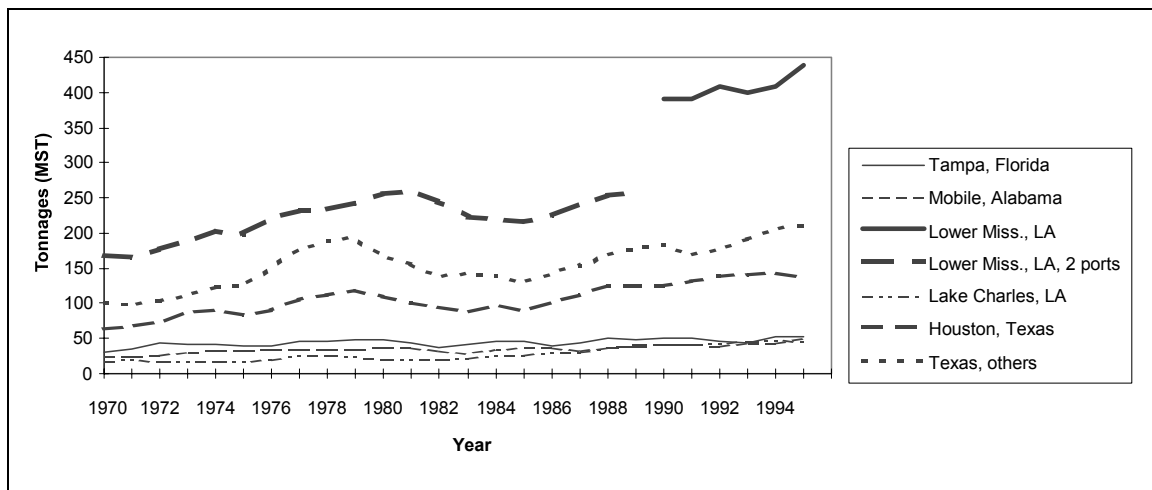


Figure 22 Major port groups on the Gulf of Mexico, traffic trends, 1970-1995

¹⁷ One way to get an idea of the size of these facilities stretching along the Mississippi is by reviewing U.S. Army Corps of Engineers port reports *The Port of New Orleans, Louisiana*, Port Series no. 20, revised 1990, NDC 90-P-4, 206 pp. and 5 maps, and *The Ports of Baton Rouge and Lake Charles, Louisiana*, Port Series no. 21, revised 1990, NDC 90-P-5, 201 pp. (Baton Rouge pp. 1 to 89) and 7 maps, including 4 for Baton Rouge. These maps are in fact collages of aerial photographs with the addition of several cartographic details, specifically the kind of port activity at each dock. At the same time, the aerial photographs give a good idea of the significance of inland and ocean navigation on the river, showing push-towed convoys side by side with ocean-going vessels and groups of barges docked along the banks.

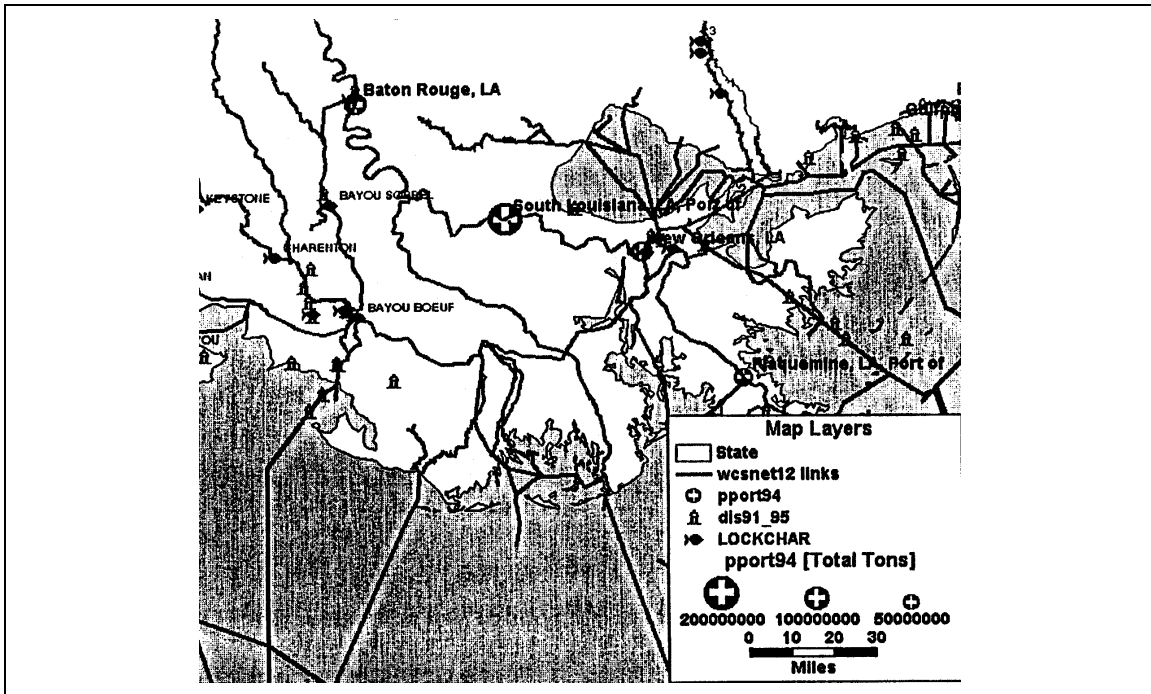


Figure 23 Location of Louisiana's major ports
(Source: U.S. Department of Transportation, Bureau of Transportation Statistics, and U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, *United States Waterway data CD-ROM, BTS CD-18*)

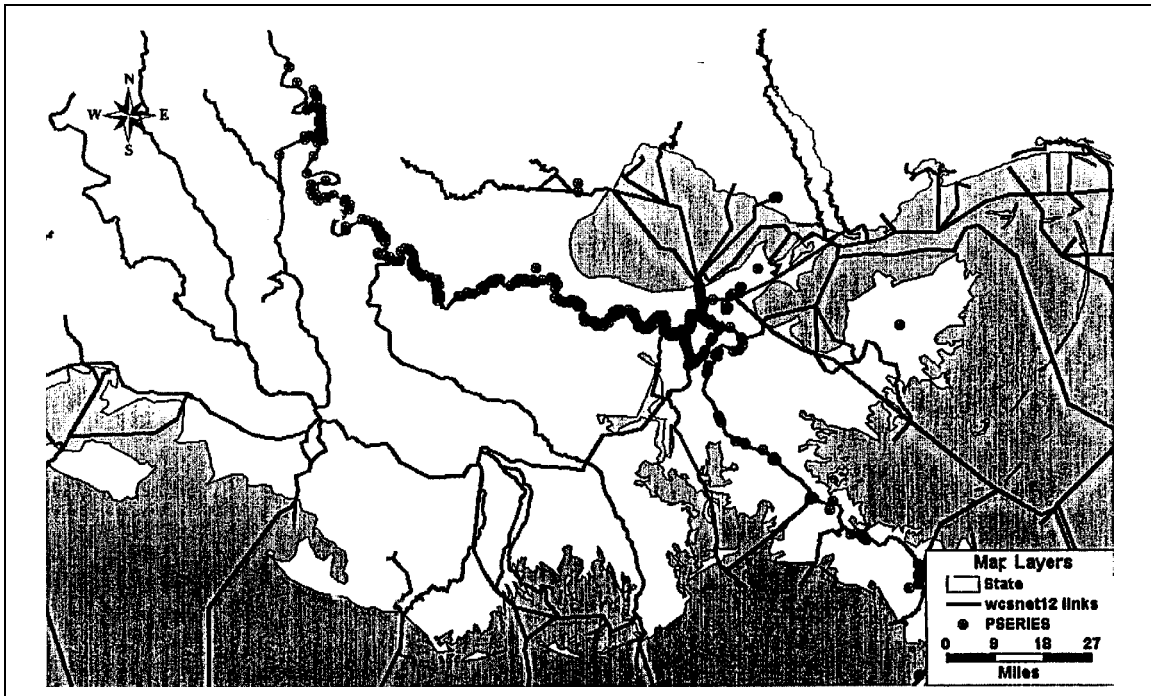


Figure 24 Port facilities on the Lower Mississippi
 (Source: U.S. Department of Transportation, Bureau of Transportation Statistics, and U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, *United States Waterway data CD-ROM, BTS CD-18*)

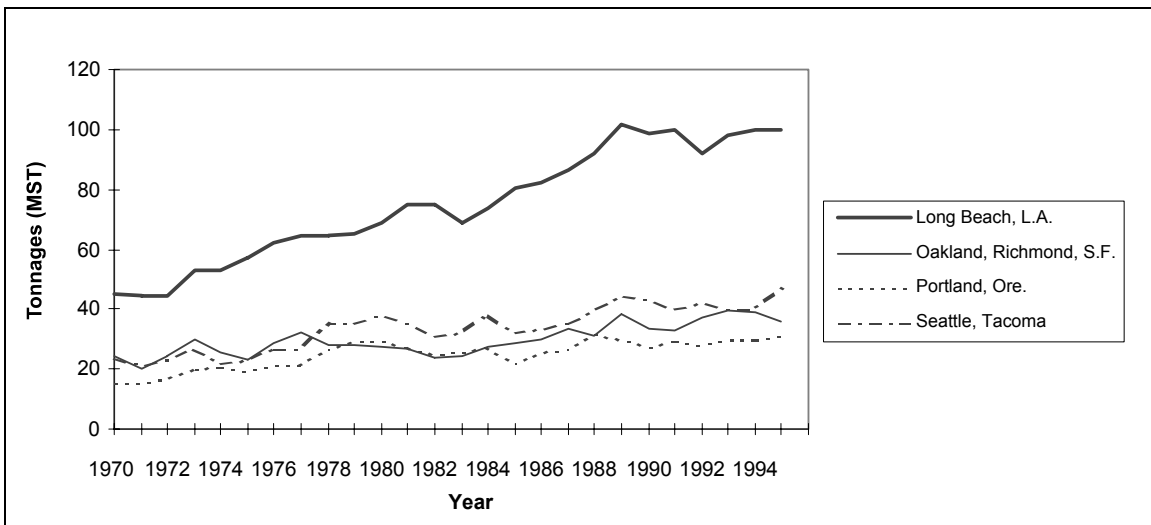


Figure 25 Major port groups on the Pacific, traffic trends, 1970-1995

These changes must, however, be interpreted in the light of the value of handled cargo. Such data are available for 1995 from the Navigation Data Center of the U.S. Army Corps of Engineers, which prepared two maps of international traffic (import and export) for major American ports (Figures 26 and 27). The first map shows volume of cargo, in short tons; the second shows value of cargo, in dollars. The first map confirms the remarks contained in the preceding review of traffic trends. The primary port group for volume is in fact the Mississippi (the Gulf Coast predominates overall). The second map, which indicates international port traffic according to the value of transited cargo, presents an entirely different picture: in fact, the Gulf Coast plays a modest role (and the Port of Houston predominates). The Atlantic and Pacific coasts are more consistent with the traditional American model of port geography considered in this study.



Figure 26 Major U.S. ports in international traffic: imports and exports in short tons in 1995 (Source: U.S. Army Corps of Engineers, Navigation Data Center, *Imports and Exports for Selected United States Ports for 1995*, New Orleans, 7 march 1997, 10 pp.)

Consider, for example, container traffic through the principal North American ports in 1995 and 1996 (Table 1). The Pacific Coast is distinguished by powerful traffic (10.7 million TEU in 1996) through a small number of ports. Long Beach and Los Angeles are clearly predominant, while the smallest port (Portland) is in decline. Vancouver handles less traffic than its two nearest competitors (Seattle and Tacoma); traffic is growing rapidly, however, in particular because of its new container terminal at Roberts Bank (Deltaport). On the Atlantic Coast, however, slightly less traffic (8.5 million TEU) is dispersed over a larger number of ports. New York is stagnating; the other ports

along the Seaboard (except Philadelphia and Wilmington) are declining; and the South Atlantic ports (except Miami) are growing. Finally, with 1.2 million TEU, the Gulf Coast is far behind the other coasts. Houston accounts for most of this traffic, while New Orleans plays a very modest role.



Figure 27 Major U.S. ports in international traffic: imports and exports, value et cargo, in dollars (Source: U.S. Army Corps of Engineers, Navigation Data Center, *Imports and Exports for Selected United States Ports for 1995*, New Orleans, 7 march 1997, 10 pp.)

Over the longer term, the imbalance between the coasts is increasing, as indicated in a graph prepared by the U.S. Department of Transportation comparing the regional distribution of the total value of international U.S. ocean-going traffic among the four coasts, including the Great Lakes, in 1980 and 1993 (Figure 28). The increase in bulk flows on the South Coast and rapid progress in container traffic on the Pacific Coast explain much of the decline on the Gulf Coast and Upper Atlantic Seaboard (significant in the former case, modest in the second) and the doubling of volume on the West Coast in 13 years.

Table 1
Major Containerized Port Traffic in North America in TEU
(Twenty Foot Equivalent Unit Containers)

		1996	1995	percentage change
Canada	Halifax	392,273	382,575	+ 2.5
	Montreal	852,530	726,435	+ 17.3
	Vancouver	616,000	496,000	+ 24.2
United States				
Atlantic	Baltimore	474,816	534,649	- 11.2
	Boston	127,087	159,844	- 20.5
	Charleston	1,078,590	1,023,903	+ 5.3
	Hampton Roads	1,141,357	1,077,846	+ 5.9
	Jacksonville	613,449	529,548	+ 15.8
	Miami**	656,217	656,175	0
	New York/New Jersey	2,215,000 *	2,218,531	- 0.1
	Philadelphia	102,104	107,148	- 4.7
	Savannah	650,636	626,725	+ 3.8
	Wilmington, Del.	162,884	156,940	+ 3.8
	Wilmington, NC.	110,471	104,038	+ 6.2
Gulf	Gulfport	153,470	104,668	+ 46.6
	Houston	794,481	704,010	+ 12.8
	New Orleans	260,879 *	297,636 *	- 12.3
Pacific	Long Beach	3,067,334	2,843,502	+ 7.9
	Los Angeles	2,682,803	2,555,206	+ 5.0
	Oakland	1,498,202	1,549,800	- 3.3
	Portland	302,171	329,748	- 8.4
	Seattle	1,473,498	1,479,076	- 0.4
	Tacoma	1,073,471	1,092,000	- 1.7

* Estimates exclude empty containers.

** For fiscal year ending September 30

(Source: *Containerisation International, Regional Review: North America*, April 1997, p. 18 (format modified))

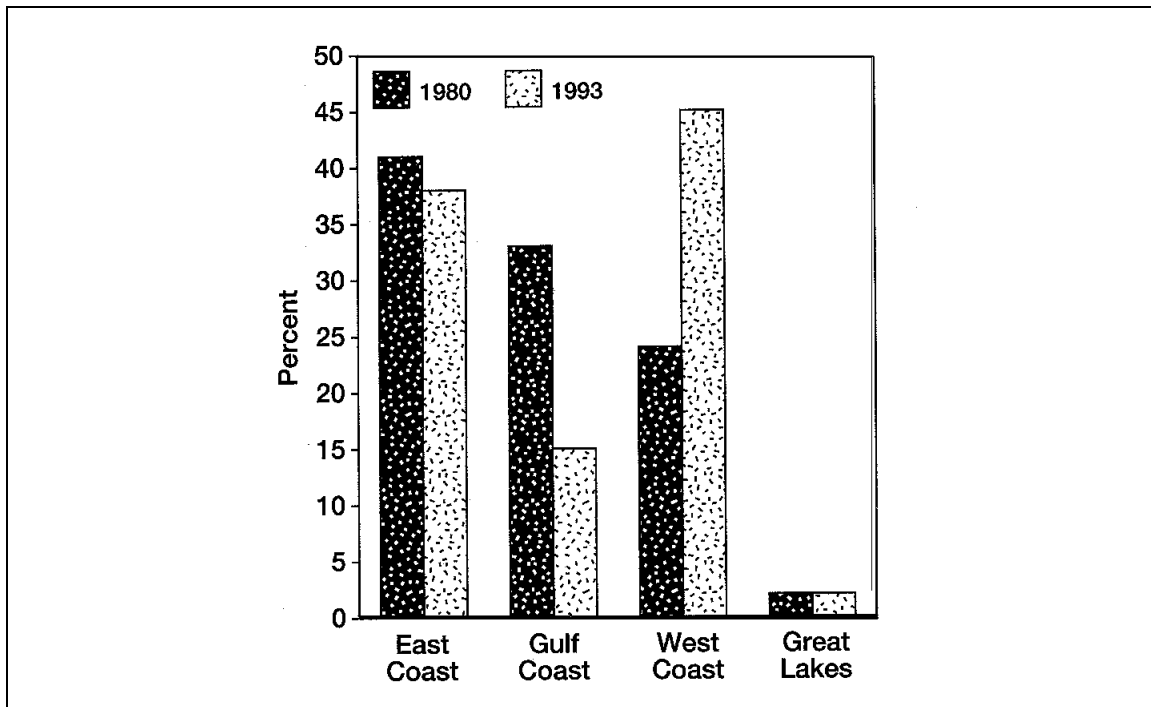


Figure 28 International U.S. ocean-going traffic among the four coasts, in percentages
(Source: U.S. Department of Transportation, *Transportation Statistics, Annual Report* 1996, p. 24)

3.5 Three Basic Themes

Three themes emerge from this brief review of trends in North American inland shipping and port traffic with respect to the gateway reference model:

1. **Traffic trends vary widely.** For example, inland water traffic is declining on the St. Lawrence but growing on the Mississippi, and even on the American side of the Great Lakes. Furthermore, trends in ocean port growth vary, depending on the coast:
 - Atlantic ports are stagnant or declining (which is small consolation for St. Lawrence ports). There are nuances, however: volume transited through New York has dropped sharply; traffic through some Atlantic ports has stagnated or dropped slightly, while other ports (such as those on the South Atlantic Coast and Halifax and Saint John, N.B., in the Canadian Atlantic provinces) have grown;

- Traffic through ports on the other seaboard (Gulf of Mexico and Pacific) has been growing fairly steadily; these ports are now the geographic leaders among North American ports (the Gulf of Mexico for tonnage, the Pacific for value).

2. **Of these North American port groups, which adhere to the gateway model? Which are the main competitors with the St. Lawrence?** The Mississippi carries the highest tonnage on the continent by far, with support from railways and a remarkably well developed river navigation system (although not the best natural navigational conditions). It tends to carry low-value cargoes, however, partly because it is poorly located with respect to the main container ship routes (which operate primarily east-west), and partly because Houston has taken on importance as a Gulf port. On the other hand, port groups on the Atlantic and Pacific coasts (except for New York) lack tri-modal access to the hinterland; since mountainous terrain isolates these ports from the interior and blocks access by water, they must rely much more heavily on rail transport. This is the reason why American agricultural commodities are shipped via the Mississippi, even though the main export route for these products is toward Asia via the Panama Canal. Canadian ports in British Columbia are far more successful than their southern neighbours at combining bulk cargo and container traffic, by shipping Rocky Mountain coal and Prairie grain to Asia, but at the price of problems (mentioned in the introduction) in hauling this heavy traffic by rail.

Finally, despite declining traffic and low utilization of the Hudson River-New York State Barge Canal water route, New York must still be recognized as the major continental gateway on the Atlantic because of its importance as a multi-purpose commercial crossroads and its leading role in co-ordinating east coast shipping traffic (particularly container traffic). The St. Lawrence port group, however, *is positioned fairly well with respect to the gateway model*, because it meets the main conditions for a gateway: tri-modal access to the hinterland; a combination of bulk cargo and container traffic; and a sizeable multi-purpose commercial crossroads in downtown Montreal.

The reference model points up other unique features of the St. Lawrence gateway. The generous clearance over the entire 3,700 km distance to Chicago in one direction and Duluth-Thunder Bay in the other is an important asset. Furthermore, downstream ports at Quebec City and (especially) the North Shore can accommodate and load large ore freighters (including self-loading lakers (see section 2.2)) and carry out any necessary transshipment operations. Relatively balanced directional cargo flows (grain and coal downbound, ore upbound), a diverse fleet of ocean-going inland vessels and lake freighters, and much more even hydrology are major advantages over the Mississippi.

The steady increase of container traffic through Montreal confirms the attractiveness of its location. To be sure, the port has its limitations: it is located 1,600 km from the ocean, far inland from the mouth of the estuary, at the end of a 35-foot-deep channel (soon to be 36 feet deep) that restricts unit capacity of container ships to 2,700 TEU.

Consequently, Montreal-bound vessels cannot continue on to other ports, thus excluding round-the-world ships and those visiting several North American ports. In other words, container ships that visit Montreal can only go back to their port of origin. On the other hand, such specialization in transatlantic relations with ports of western Europe and the Mediterranean has undeniable advantages: the St. Lawrence axis is the shortest (great circle) route between the centre of the North American continent and the coast of Europe, making Montreal one of the rare ocean ports that is also far inland, 500 km from New York in straight-line distance. No other North American port is in this position. Concretely, this means that *using medium-sized container ships, shipping companies can extend the containerized traffic system they have established on the oceans into the continent itself, with no transshipment and using the shortest route*. This is a significant advantage and creates an interesting “niche” opportunity: for example, the only way to extend containerization inland up the Rhine over comparable distances (500 km) from the ports of Antwerp and Rotterdam would be to transship to river convoys with unit capacity of 300-400 TEU. Therefore, the Port of Montreal plays two distinct roles: it is at once an ocean port and an inland multimodal platform. In addition, it is well located for access to markets at the interior of the continent, because of its highly efficient rail connections to specialized multimodal platforms in Toronto (500 km), Detroit (850 km), and Chicago (1,300 km).

How is it, then, that the St. Lawrence has not done better against its competitors (the Mississippi and West Coast ports for bulk cargoes, Atlantic Coast ports for containers)? It may be because of difficult winter conditions, which encourage competition from American and Atlantic Canadian ports (especially Halifax, although technically this port could be viewed as a St. Lawrence port because its container trains pass through the St. Lawrence Valley and Montreal, where much of their cargo is eventually handled). The American border may put something of a damper on bulk cargo traffic, as was suggested in section 3.3.2 with respect to ore and grain movements. But do major stakeholders (or the general public) realize that this gateway even exists?

3. More precisely, Canada may need to adopt an effective policy for promoting the St. Lawrence gateway. In this regard, the following are essential:

- a comprehensive approach (considering the St. Lawrence ports not as competing units but as complementary tools, each sharing in the handling of bulk cargo and container traffic through the continental gateway) requiring effective co-operation between all organizations, not central administration;
- continued work to improve trade relations between the gateway and its hinterland (already begun through the development of such tools as the St. Lawrence-Great Lakes Forum, and the Conference of Mayors of Cities in the St. Lawrence-Great Lakes System¹⁸);

¹⁸ The remarkable work of Hugues Morrissette and the team of the *Secrétariat à la mise en valeur du Saint-Laurent* (St. Lawrence Development Secretariat) in Quebec City, based on the fundamental

- The great distances that characterize this immense continent and generous clearances available on its major waterways, which permit ocean-going vessels to sail deep into the centre of the continent, must be taken into account more effectively by spreading the gateway function over a wide area. If the Mississippi is presented as an *extended bulk gateway* stretching over 400 km, the St. Lawrence is a *more complete extended gateway* stretching over 850 km from Montreal to Sept Iles, with the multi-function trade crossroads and container port at the upstream end. This is an exceptional advantage. Transforming this wonderful, under-utilized tool into a true gateway, however, will require considerable awareness building in the shipping industry and community at large. In addition, policy in this area must take account of issues enumerated above.

In this regard, it is useful to recall that *competition among ports is continental*, and will be keen for both container and bulk cargo traffic at North American ports and port groups in coming years. Competition for bulk cargo traffic will be particularly intense between the two major river/gateway systems.

The gateway concept, however, does not capture all aspects or facets of the St. Lawrence-Great Lakes system. Specifically, as a tool for inland navigation, the system also provides other major continental transport services.

idea that the St. Lawrence gateway must develop and maintain extremely close relationships with its hinterland in Canada and the United States.

4. THE ST. LAWRENCE-GREAT LAKES SYSTEM GATEWAY AND WATER TRANSPORT SYSTEM IN A TIME OF INTERMODAL COMPETITION

Much of the traffic on the St. Lawrence is typical of the gateway function described in the last section (Figures 2 to 8): agricultural commodities and coal for export; iron ore shipped toward the Atlantic from North Shore ports; mineral ore and steel products from other continents bound for aluminum and steel plants on the shores of the St. Lawrence and Great Lakes; aluminum and paper for export to foreign markets; crude oil destined for the Ultramar refinery near Quebec City; and containers.

Other kinds of traffic use the same navigational infrastructure but remain on the continent and do not use the gateway: Appalachian coal for thermal power plants and steel mills on the shores of the Great Lakes; iron ore from Northern Quebec and Labrador shipped upstream from North Shore ports to the Great Lakes steel plants; iron ore from the Mesabi Range in the United States shipped downstream from Lake Superior ports to the Great Lakes steel plants; refined hydrocarbons distributed from refineries toward regional depots on the shores of the Great Lakes and St. Lawrence; aggregate and construction materials; cement; salt; and so on.

Clearly, then, the St. Lawrence-Great Lakes system plays a fundamental logistical role for many major Quebec and Ontario industries, including steel, aluminum, oil refining, pulp and paper, construction, and public works (Lasserre, 1989). The composition of traffic also underscores the system's dual function as a gateway and inland transportation tool, and (since the traffic is largely complementary in terms of logistical organization) its complexity and economic advantages.

4.1 Complexity and Complementarity of Traffic

This inland navigation system is unlike any other in the world. Elsewhere, a different model generally applies: a nearly absolute requirement for break of load between seagoing and inland navigation at the mouth of the river (except for a few small ocean-river ships with capacity far below those used on the St. Lawrence, in the order of a few thousand tonnes deadweight). In this model, the port or port group at the mouth of the river by itself performs the gateway and ocean/inland load breaking functions, yielding two separate navigational spaces: ocean-going vessels cannot sail up the river, and barges or self-propelled river vessels cannot venture further downstream, toward the ocean.

With its exceptionally generous clearances, however, the St. Lawrence-Great Lakes system is much more complex: seagoing vessels can navigate inland as far as Montreal, some 1,600 km from the Atlantic; on the entire upstream system, exceptionally large ocean-river ships (as large as about 30,000 DWT) coexist with an inland fleet composed

itself of very large self-propelled vessels. While the usual weight for these vessels is 27,000 DWT, vessels weighing up to 65,000 DWT are not uncommon in the American lake boat fleet operating between Lakes Erie and Superior, above the Welland Canal. In particular, the Poe Locks at Sault Ste. Marie can accommodate vessels up to 308 m (1,013 feet) long and 32 m (105 feet) wide, while other locks in the system can accommodate units up to 224.5 m (738 feet) long and 23.12 m (76 feet) wide (Greenwood and Dills, 1996).

Moreover, this coexistence of two fleets (and even three, downstream from Montreal) finds its echo in two traffic flows (gateway-related traffic and inland traffic) that, while interrelated and intertwined, poorly reflect the distribution of seagoing vessels, ocean-river ships and lake boats. Furthermore, since the opening of the St. Lawrence Seaway in 1959, the strength of this system derives from the complementary, balanced traffic flows on many of its segments.

4.1.1 Complexity

The complex logistic organization of St. Lawrence traffic can best be understood through an example. Most traffic exported to other continents involves agricultural commodities, which are transported through most of the system by lake boats and ocean-river ships.

- In keeping with the model described above, lake boats carry agricultural commodities towards a St. Lawrence port, where it is transshipped to a seagoing vessel bound overseas.
- Seaway-size ocean-river ships load the same grain in Great Lakes ports and take them directly to overseas export markets, without passing through a St. Lawrence port.

Therefore, the gateway function is of interest not only to St. Lawrence ports, but also (to a modest but significant degree) all ports in the system: they can accommodate ships, unload cargoes arriving directly from overseas origins and load (in the same or another port) a new cargo for shipment to an overseas destination. Such complementary traffic flows are important, because they allow shipping companies to minimize empty vessel movements.

4.1.2 Complementary traffic flows

There are two kinds of complementary traffic flows:

- those (as described above) that provide the shipping company with cargo for travel in both directions by the vessel (either a lake boat, ocean-river ship, or seagoing vessel);
- those that combine gateway-related traffic and inland traffic.

Traffic of the first kind is essential to the competitiveness of the St. Lawrence-Great Lakes navigation system, because the shipping company can carry both upbound and downbound cargo. As vessels do not need to return empty, customers are only billed for a one-way trip. In one classic example, lake boats “take down” grain from the Lakehead (Duluth or Thunder Bay) to Baie Comeau or Port Cartier on the North Shore of the St. Lawrence estuary, and reload iron ore at Port Cartier or Sept Iles/Pointe Noire for shipment to steel-making ports (such as Hamilton or Nanticoke) on the Canadian shore of the Great Lakes. Some of these lake boats are then able to find other upbound cargo, such as coal from a port on the south shore of Lake Erie.

In another classic example, ocean-river ships carry steel products such as ingots or coils from an industrial port zone on another continent directly to Great Lakes steel plants, and then carry a return cargo of grain to an overseas market. Complementary directional flows such as these are not easy to come by. Clever shipping companies will draw upon long-standing relationships with an extensive customer base to negotiate attractive prices for bidirectional traffic, thereby optimizing ship movements.

Other advantages can be gained by combining flows from opposite directions. While in theory seagoing and ocean-river ships only carry gateway-related cargoes, there may be exceptions. For example, titanic iron ore is carried from Havre St. Pierre on the North Shore to Sorel (near the plant that processes this ore) by a seagoing ore freighter. In the same vein, Oceanex ro-ro container ships keep a regular schedule between Montreal and St. John’s, Newfoundland – an example of seagoing ships that carry out intra-continental transport. Similar versatility is possible with lake boats, which can carry gateway-related cargoes (such as grain) as well as inland cargoes (such as iron ore between the North Shore and the shores of the Great Lakes). Such “tandem” flows in opposite directions since the opening of the Seaway have ensured the success of the St. Lawrence waterway and Canadian Great Lakes shipping companies.

American shipping companies, however, have always had more trouble finding bi-directional cargoes, because their market consists essentially of downbound cargoes, particularly grain from the Midwest and iron ore from the Mesabi Range. Upbound cargoes are rare since the collapse of the traditional market for coal. Consequently, part of the American lake boat fleet is owned by steel companies, which use them for private shipping. Lake transport has survived because of economies of scale made possible by the use of jumbo ships and, as noted above, the construction of the Poe Locks by the Army Corps of Engineers. A 1996 inventory of the Great Lakes fleet by size counted 25 vessels too large to use Seaway facilities, including 13 that were 304 m (1,000 ft) long or more (Greenwood and Dills, 1996). The Americans’ use of jumbo ships compensates for markets that are less balanced than their Canadian counterparts; at the same time, however, this decision to serve strictly continental markets isolates shipping companies from any contact with ocean navigation, severely limiting their operating flexibility (Lasserre, 1989).

4.1.3 Current market and fleet trends

Recent changes in major Canadian traffic patterns are causing problems for the St. Lawrence-Great Lakes shipping industry. As noted in the previous section, much of the relative drop in traffic on the St. Lawrence can be traced to declines in upbound iron ore traffic beginning in 1978 (Figure 6) and downbound grain traffic beginning in 1985 (Figure 5). Neither traffic flow has recovered to its previous level. This has created some fleet over-capacity problems for shipping companies.

Operators of ocean-river ships (particularly Fednav, long the heaviest Seaway user) have probably had more success managing these problems, since much of their fleet is made up of leased vessels. By leasing ships for the navigation season, shipping companies elegantly circumvent the problem of winter closure of St. Lawrence facilities upstream from Montreal and Great Lakes facilities, while easily adapting the size of their fleet to the size of the market. Another, sizeable part of the Fednav fleet, constructed in Korea in the late 1970s and in China more recently, is equipped for navigation through ice and capable of serving St. Lawrence ports year round (Lasserre, 1989). The capacity of many of these vessels exceeds that of the Seaway. For example, three vessels in a series constructed in Korea in 1977 were originally 222.5 m long and 23.1 m wide (close to the allowable limits for the Seaway). With these dimensions, their unit capacity is 26,400 DWT in the Seaway, and 38,500 DWT elsewhere.

A comparable series now being constructed in Shanghai for delivery in 1997 holds great commercial promise for the St. Lawrence-Great Lakes route. Six ships with unit capacity of 34,000 DWT and reinforced hull for ice navigation have been ordered for delivery in 1996-1997 (*Canadian Sailings*, December 2, 1996, p. 58). Like those in the previous series, these ships must unload part of their cargo in a St. Lawrence port before entering the Seaway, and must pick up additional cargo at one of the same ports before entering the Atlantic. This reflects an awareness of the complementary roles of St. Lawrence and Great Lakes ports in carrying out the gateway function. At the same time, the main interest of these ships is to carry out direct transport (with no transshipment) between Great Lakes ports and origin/destination ports on other continents.

Great Lakes shipping companies that own their fleets, however, are experiencing more serious problems, because they were the first to feel the effects of the decline in St. Lawrence grain and iron ore traffic since the late 1970s. They too are concerned about over-capacity in their fleets, which are aging as companies cease to order new vessels. Of the 176 self-propelled American and Canadian ships of more than 220 tonnes gross tonnage in service in 1996, 42 vessels were launched before 1959 (when the Seaway was opened); 130 were launched between 1959 and 1983; and only four were launched since 1983 (the most recent in 1990) (Greenwood and Dills, 1996). The Canadian fleet by itself consists of 99 units, including four launched before 1959, 92 launched between 1959 and 1983, and only three launched since 1983 (the two most recent in 1985).

This aging of the Canadian fleet was of some concern to the House of Commons Standing Committee on Transport, which in its 1995 report to the government recommended “an incentive program to stimulate new construction and refitting of Canadian and foreign flag Seaway-size ships based on the essential condition that the work is done in Canadian shipyards” (*A Canadian Shipping Policy*, May 1995). These suggestions do not, however, appear to have found their way into government policy.

Recent fleet pooling is another sign that Canadian Great Lakes shipping companies are in difficulty. Specifically, two Canadian companies, Upper Lakes Shipping Group Inc. and Algoma Central Corporation, combined their conventional bulk freighters into a commercial pool called Seaway Bulk Carriers, and their self-unloading vessels into another pool called Seaway Self Unloaders. The 26 vessels in the first pool represent total capacity of 735,000 DWT; the second pool contains 19 units of up to 35,000 DWT unit capacity. These pools do not enjoy a Canadian monopoly because there are other fleets. For example, Canada Steamship Lines operates 15 vessels (Bowland, Friend, Cowan, 1996).

All St. Lawrence-Great Lakes shipping companies have suffered recently as competing modes (especially the railways) improve their performance and undermine the competitiveness of shipping in general.

4.2 Some Instances Where Intermodal Competition Has Hurt the St. Lawrence

As reported in a number of trade publications, this great waterway (while the most economical and environmentally friendly means of transport) is currently facing competition on a number of different fronts.

4.2.1 Containers

Besides competition from ports on the U.S. Atlantic Seaboard, the main Canadian competition to the St. Lawrence waterway comes from the Port of Halifax and the Canadian National (CN) railway, which was privatized in 1995 following heavy investment in a new high-clearance tunnel under the St. Clair River to carry double stacked container convoys in the Montreal-Toronto-Detroit-Chicago corridor. By changing its status, this railway could downsize considerably, thereby significantly improving its productivity. The company recently announced a service to run double-stacked convoys between Halifax and a new, specialized terminal in the Chicago area in 56 hours.

In fact, the strategy adopted by ocean shipping companies that opt for Halifax and CN is completely different from that adopted by their Montreal competitors working with Canadian Pacific (CP). As discussed in section 3.5, this latter group is exploiting a distinctive market niche by serving central Canada and the American Midwest with

vessels of 2,700 DWT maximum capacity that make only one stop; the former group, on the other hand, operate on the New York route, where dock clearances are so limited that their larger vessels must stop at Halifax, to unload part of their cargo in one direction and complete their loads on the return trip. At a time when competition between ocean shipping lines (and ports) is based primarily on the ability to serve the hinterland at reasonable cost, the considerably longer rail distance in the Halifax/CN alternative compared with the Montreal or New York alternatives is hard to understand: the distance from Montreal to Chicago is 1,347 km, and from Montreal to Halifax is 1,352 km! (As published in the Via Rail national timetable, pp. 12 and 24.)

Furthermore, there are no feeder services (in the form of small container ships that pick up and deliver containers to larger ships) operating from Halifax to the St. Lawrence ports, or from Montreal to these same ports or those on Lake Ontario and Lake Erie. One of the advantages of this kind of service is speed: dockside cranes transfer containers directly between the larger and smaller vessels, without using the dock. The feeder vessel is already under way by the time the railway has loaded its train convoys and dispatched them to the trunk line. Several individuals interviewed for this study acknowledged that this is a curious situation: such a service (Manchester Liners) had previously operated out of Montreal; for some reason, no one has ever brought back service of this kind. The interruption of navigation upstream from Montreal in winter and the extremely close alliances between shipping companies, ports and railways (CN in one case, CP in the other) may be the answer.

4.2.2 Liquid bulk cargoes

Two highly interesting recent cases illustrate ways in which the waterway has lost business to competing modes. First, fuel oil and gasoline shipments to Montreal from the *Ultramar* refinery near Quebec City, which had used oil tankers on the St. Lawrence, have gone to CN. To be sure, the shipping company Socanav, which went bankrupt in early 1997, was very poorly managed; it suffered from fleet over-capacity, maintained its vessels poorly, and had substandard on-board security (*The Gazette*, 7 February 1997). Ultramar was probably unhappy with the service. It accepted the offer by CN, which then invested in a new train convoy, the *ultratrain*, on which all tank cars could be loaded and unloaded at the same time. It may be that shippers wanted to avoid Coast Guard cost recovery and the new tax to support rapid response in the case of oil spills into the river. It is not clear, however, what will happen if there is a railway accident (as has occurred in both France and Canada): oil spills on land are far more difficult to clean up than those on water, for which efficient techniques exist. An explanation may be found in the ambitions (and aggressive business practices) of a recently privatized CN. By taking business away from the waterway, this railway is trying to position itself in a much larger market: Ultramar is increasing the capacity of its refinery near Quebec City to distribute its products in New England. CN has no competition in this market.

The other case involves the distribution of refined petroleum products in the Saguenay-Lac St. Jean region northwest of Quebec City. Previously, these products were shipped

by water from petroleum depots in Quebec City and Montreal to the Port of Chicoutimi, where they were transferred to tanker trucks for distribution to service stations. For some time, trucks have been carrying out the same distribution directly from depots in Quebec City, through the Parc des Laurentides. Apart from environmental issues raised by this practice, each trip these very heavy trucks make (weighing over 10,000 times more than a private automobile, according to representatives of Transport Quebec) causes the road surface to deteriorate and involves a hidden taxpayer subsidy. This is yet another argument in favour of introducing highway tolls for heavy trucks on certain roads, to re-establish some semblance of intermodal cost equity.

4.2.3 Solid bulk cargoes

Two other interesting examples involve transport of grain. The first concerns distribution of livestock feed grain from the Canadian prairies to the Atlantic provinces. In 1996, Halifax Grain, a local company that received supplies by water (Canada Steamship Lines from the Great Lakes), submitted a complaint to the Canadian Transportation Agency (CTA), claiming that CN was engaging in unfair competition by charging unreasonably low rates to transport grain from points in the American Midwest and Western Canada to Nova Scotia. In August, the CTA found in favour of the plaintiff, and ordered the railway to increase its rates for transporting this particular category of grain. Because this increase had no effect on rates for distribution, however, Halifax Grain filed another complaint with the CTA in late September, arguing that CN's rate increases were inadequate and prejudicial to its operations. At year's end, the CTA found, after verification, that the railway had fully complied with its August order (Peters, 1997).

This is a very interesting case, which deserves closer examination. How extensive are the grain shipments involved? What regional storage facilities are available to the two competitors? Is CN's practice of vertical integration not a way of transferring certain costs to other budget items? On the other hand, does the bimodal water route represent the best effort by each of the links in the chain to reduce costs? In fact, the supply route to Halifax Grain using Canada Steamship Lines involves shipment by rail, transshipment in a Great Lakes port, transport by water and unloading at Halifax, with possibly another transshipment in a St. Lawrence port if a coastal ship must take over from a lake boat. In other words, the strategy may be less than ideal.

Another example is provided by the growing practice of transporting grain for export on direct rail convoys from the Prairies or Thunder Bay to Quebec City, where they are loaded on seagoing vessels. Since it is equipped with grain winnowing facilities, the Port of Quebec City can directly receive grain from the silos of producer co-operatives on the Prairies. Those who take issue with this rail "short circuit" point out that these shipments use hopper cars owned by the federal government and intended for transport of grain exclusively in Western Canada, between Vancouver and Thunder Bay. The federal government appeared to agree with this point of view to some extent, because in 1996 it decided to sell these 12,965 hopper cars (Transport Canada, 1996). Consequently, the railways will have to use their own money to buy these or other cars.

The issues raised by these examples were addressed in a study published in February 1996 by the Transport Institute of the University of Manitoba (Heads, Wilson, Hackston, Lake, 1996). The authors do not anticipate a dramatic increase in grain traffic in coming years. With regard to the competitiveness of various possible routes, they write:

The most competitive route for transporting grain from the Prairies for export remains the traditional route combining railway to Thunder Bay and water to ports of transshipment. Direct rail transport from the Prairies to transshipment silos on the St. Lawrence is now virtually fully competitive with the traditional route.

They add that this should be even more true in coming years, if railways continue to improve their productivity. In addition, they claim that one reason railway productivity is improving faster than water transport productivity is the limited capacity of the Seaway (i.e., units are restricted to a maximum of 27,000 DWT) (Heads, Wilson, Hackston, Lake, 1996). While they do not bring up the issue of use of federal government hopper cars, their calculations do depreciate these cars over 30 years. Finally, they stress that (depending on changes in a number of factors, including the rate of exchange between the U.S. and Canadian currencies) the Gulf of Mexico route could become highly competitive as well, either using the Mississippi (intramodal competition) or the railways (intermodal competition).

On the other hand, the authors are categorical regarding shipments of grain as far as Halifax. They state that direct rail transport from the Prairies to Halifax is not competitive. While rail can compete with the waterway as far as Quebec City because it has the advantage of avoiding transshipment at Thunder Bay, this competitiveness does not extend to shipments as far as Halifax (Heads, Wilson, Hackston, Lake, 1996). While they do not say so specifically, it may be assumed that they arrive at this conclusion by comparing costs of direct railway shipment to those of traditional shipment by water, with no intermediate transshipment at a St. Lawrence port.

The authors recommend a number of avenues to improve the waterway's productivity in response to growing competition from the railways: rationalization of grain traffic prior to shipment from the Prairies; complete reorganization of rail and elevator facilities in Thunder Bay (these aging installations slow boat loading operations and increase costs); continued rationalization of transshipment facilities in St. Lawrence ports (already under way at Montreal and Trois Rivières); negotiation of freight rates between the Canadian Wheat Board and lake shipping companies in exchange for guaranteed volumes; improved co-operation with iron ore and steel industries to better utilize capacity and improve logistical organization of the lake fleet (Heads, Wilson, Hackston, Lake, 1996).

Clearly, then, the St. Lawrence-Great Lakes shipping route does not enjoy a comfortable position, despite its natural advantages and generous clearances. As traffic stagnates, its ability to compete is in doubt. Structural reforms may be called for.

5. A NEW DEAL FOR THE ST. LAWRENCE

Against this background of increased competition at sea and inland, the federal government has decided to take action with respect to the shipping industry.

5.1 Current Developments in the Federal Government

For essentially budgetary and financial reasons (Canada is one of the most heavily indebted industrialized nations – more than CAN \$600 billion in outstanding debt – and is trying hard to reduce its deficit) the federal government decided to review many of its policies, including transportation policies. Without abandoning its responsibilities in the areas of safety and environmental protection, it intends to reduce its activities in this area, and transfer certain responsibilities (where possible) to user groups or local organizations. Its objective is to reduce its expenses and subsidies and apply the “user pays” principle more generally. This policy applies to all transport modes.

5.1.1 Air and surface transport

Air transport has undergone the most profound changes, namely, the ongoing transfer (through lease or transfer to regional interests) of the 26 airports in the National Airport System (NAS), which serve 94 percent of air passengers, as well as most other regional and local airports, so that management costs will be paid by users and not by taxpayers; and (under the *Civil Air Navigation Services Commercialization Act* of 20 June 1996) the transfer of civil air traffic control across Canada to Nav Canada (a corporation established in May 1995) in exchange for \$1.5 billion paid to the federal government.

Surface transport: According to the same principles, the *Western Grain Transportation Act*, as well as financial assistance for transport of cargoes from the Atlantic provinces, were abolished on 1 August 1995. Generous transition subsidies were available, however. Agriculture Canada budgeted \$1.6 billion for compensation to western farm owners in 1996, as well as \$300 million for necessary adjustments during 1996-1999; furthermore, Transport Canada will make \$326 million in transition payments (over six years) to affected industries in the Atlantic provinces. In addition, CN was privatized (bringing in \$1.2 billion to the federal government, with an additional \$300 million from land sales) (Transport Canada, 1995 and 1996). The *Canada Transportation Act* of June 1996 greatly simplifies procedures for network reorganization, by allowing railway companies to focus solely on trunk line operation. In this regard, railways are required to prepare three-year plans indicating lines that they intend to continue to operate and secondary lines that they intend to sell or abandon. This legislation is expected to stimulate a major reorganization of the Canadian rail system; in fact, this reorganization is already under way.

5.1.2 Ocean and inland water transport

The government is acting on two fronts with regard to water transport. First, Bill C-44, the *Canada Marine Act*, was submitted to Parliament in 1996, but was not passed before the House of Commons was dissolved in the spring of 1997. Identical or revised legislation will probably be placed back on the agenda for the new Parliament in the fall of 1997. In its present form, the legislation calls for a complete reorganization of the port system, transfer of management of the St. Lawrence Seaway to a new agency, a refocusing of pilotage services, and a revision of the ferry service assistance policy to reduce federal financial assistance. This section describes reforms planned for the first three of these areas.

Eighty percent of all traffic using **the port system** is concentrated in 40 of the 572 ports under the jurisdiction of Transport Canada. In addition, ports are covered by a variety of regulatory regimes: under legislation passed in 1983, most major public ports come under the administration of the Canada Ports Corporation, while other ports are managed by port commissions operating under three different pieces of legislation. In addition, 548 port sites are managed directly by Transport Canada (even though many no longer have wharf facilities); some 2,000 fishing and small craft harbours and ports are managed by Fisheries and Oceans Canada, a different department. Finally, private ports operating without government assistance handle 10 percent of cargo traffic. Labour relations with dock workers at many of these ports have been difficult. The *National Marine Policy* notes that “workers at ports have been legislated back to work 14 times since 1972” (Transport Canada, 1995).

Consequently, the Act calls for the disbanding of the Canada Ports Corporation and the transfer of operational control for individual ports to separate Canada Port Authorities (CPAs) governed by boards consisting of representatives of user groups and various levels of government. The federal government would continue to own ports and lease them for a fee to local agencies, but would cease to provide financial assistance. On the other hand, ports would be entitled to borrow on financial markets, and would be exempt from certain municipal taxes by virtue of their federal status. Eight ports that already enjoy financial autonomy (from east to west: St. John’s, Nfld, Halifax, Saint John, N.B., Quebec City, Montreal, Vancouver, the Fraser River, and Prince Rupert) will be accorded this status from the outset. Other ports will be entitled to obtain this status if they meet certain criteria, namely, service by all modes, a significant hinterland, and (especially) financial autonomy. Other ports (designated as regional or local ports) will be transferred to provincial governments, municipalities, community organizations, private interests, or other federal departments. Finally, about 60 ports serving isolated communities (primarily in northern Canada) will be designated “remote ports.” Transport Canada will continue to manage these ports directly, through an annual operating and capital fund.

Furthermore, the government has determined that the **St. Lawrence Seaway** “must be a cost-effective, competitive transportation route for the movement of bulk commodities”

but that it is “too costly” and “needs a management structure that will be more efficient and responsive to users’ needs” (Transport Canada, 1995). Consequently, Part III of the *Canada Marine Act* gives the Minister of Transport full power to assign management of this facility to a user group established as a private non-profit corporation. Paragraph 3.2 of section 69, however, states that “the terms of an agreement with a not-for-profit corporation or other person shall include a clause providing for the termination of the agreement in the event of the establishment of a body under an international agreement in respect of the Seaway.” In other words, the government is torn between two or three possible alternatives (transfer of management of the facility to a Canadian non-profit corporation; increased co-operation with the United States, with possible establishment of a bi-national agency; or a subtle combination of the first two options) and is conducting discussions with American authorities and a Canadian user group prepared to take over from the existing St. Lawrence Seaway Authority. Although this situation surely creates uncertainties that discourage rapid progress by major shipping industry stakeholders, not much more can be said for the moment.

Finally, with regard to **pilotage**, Part VII of Bill C-44 introduces a number of modifications to the *Pilotage Act* of 1972. Although the government intends to place pilotage services under four distinct regional pilotage authorities (Atlantic, Laurentian, Great Lakes, and Pacific), it is insisting that authorities reduce user costs and (as provided for in the 1972 legislation) no longer wants to provide financial assistance to cover their deficits. In addition, Bill C-44 requires authorities to consult with users to review the list of mandatory pilotage zones, standards for issuing pilots’ licences, certificates to captains and officers with recognized experience on board Canadian ships, and crew training conditions.

Another component of Canadian transport policy not covered by Bill C-44 concerns cost recovery. Specifically, the transfer of the **Canadian Coast Guard** from Transport Canada to Fisheries and Oceans Canada in 1995-1996 has affected commercial shipping conditions on the St. Lawrence in a number of significant ways. First, the transfer has generated economies of scale worth \$56 million in 1996-1997 and \$97 million in each subsequent year (Transport Canada, 1996). Other savings will accrue from the Coast Guard’s decision to cease dredging operations. Furthermore (once again in keeping with the “user pays” principle), the government has decided to make commercial shippers pay for such Coast Guard services as buoys, lighthouses, icebreaking, and ship communication services. The Coast Guard has assessed these costs for Canada as a whole (including the St. Lawrence and Great Lakes) and decided to recover them from users gradually according to a “20-40-40-60” formula (\$20 million in 1997, \$40 million in each of 1998 and 1999, \$60 million from the year 2000 onward).

The shipping and industrial communities protested loudly, objecting (convincingly) that the Coast Guard could save a lot of money by reorganizing the entire system of navigational aids and adopting new technologies, and by reorganizing its icebreaker fleet, which is too large and assigned to bases that are poorly located with respect to needs. It was also pointed out that Coast Guard headquarters is “over-sized” and that

regional branches could administer most programs. In other words, before it agrees to gradually assume the costs of the Coast Guard, the business community would like this agency to demonstrate that it is well managed (*La Presse*, Montreal, 18 February 1997). These discussions forced the federal government to backtrack somewhat: in March 1997, Fisheries and Oceans Canada announced a temporary freeze of the “20-40-40-60” program at its initial level (more precisely, a “bill” of \$26 million per year) for 1997 and 1998, and a review of this policy in partnership with the affected industries (Fisheries and Oceans Canada, 20 March 1997).

Finally, the cost recovery program for commercial shipping includes an environmental aspect as well. Five private corporations, certified by the Coast Guard and equipped with rapid response capabilities, have been established in Canada to fight oil spills. One such corporation will serve the Great Lakes in Ontario; another will serve the St. Lawrence River and Gulf of St. Lawrence. These corporations are empowered to collect taxes from each vessel and petroleum handling facility, and per tonne loaded or unloaded for international cargoes. These measures too provoked loud protests from the Canadian shipping industry.

Can a St. Lawrence gateway confronting growing continental competition afford these changes? Specifically, at the Canadian government’s request these measures have already been evaluated by a team of consultants with considerable experience in this area. The report of these consultants was published as the *Hickling Report* (Hickling Corporation, 1996). More recently, a second report on a number of these issues was prepared by a team from Quebec City.¹⁹ This review will summarize the work of these two teams, and add a few comments in light of the issues raised above.

Measures (either planned or already implemented) can be divided into two groups: reforms introduced in Bill C-44 concerning the organization of Canadian commercial shipping (Canadian Port System, pilotage authorities, St. Lawrence Seaway Authority) and carried out by Transport Canada; and measures introduced by Fisheries and Oceans Canada to recover costs of Coast Guard services to commercial shippers. These two sets of proposals are discussed separately.

5.2 Proposed Structural Reforms

The first set of proposals would reform a number of administrative structures, according to the principles set out in the *National Marine Policy* (Lasserre, 1989). First, the Policy states that:

¹⁹ *Analyse de l’approche et des conclusions de l’étude Hickling* (Assessment of the impact of federal marine cost recovery measures on selected St. Lawrence industries: Analysis of the approach and conclusions of the *Hickling Report*), report prepared by a team directed by Pierre Fréchette, professor at Laval University, March 27 1997, 34 pp.

Much of Canada's marine system is overbuilt and overly dependent on government subsidization. Canada's marine system must be more responsive to the needs of its users. Canadian taxpayers can no longer afford the status quo.

The *National Marine Policy* changes only the Government of Canada's direct operating role in the marine sector. The government's commitment to high levels of safety, security and environmental protection throughout the system remains the same.

The objectives of the National Marine Policy are to:

- ensure affordable, effective and safe marine transportation services;
- encourage fair competition based on transparent rules applied consistently across the marine transport system;
- shift the financial burden for marine transportation from the Canadian taxpayer to the user;
- reduce infrastructure and service levels where appropriate, based on user needs; and
- continue the Government of Canada's commitment to safe transportation, a clean environment, and service to designated remote communities. The government will also maintain its commitment to meeting all constitutional obligations.

Finally, the government explains what it means by "commercialization" of transport services:

Reflected throughout the *National Marine Policy* is the principle of commercialization. In some cases, commercialization means creating new management structures to make operations more efficient. In other cases, it means reducing costs to the taxpayer by accounting for the real costs of a service, making sure costs are clear and transparent to users, and designing more efficient charging systems. It also means letting users decide what services they will receive and pay for. It may mean letting the private sector deliver certain services. Commercialization, in all cases, means eliminating unnecessary regulation and outdated legislation (Transport Canada, 1995).

The next section describes how these principles should be applied to the three structures discussed above.

5.2.1 Reform of the National Port System

The least controversial reform is probably the disbanding of the Canadian Ports Corporation (CPC). The report of the House of Commons Standing Committee on

Transport is very explicit in this regard. After numerous hearings, the Committee concluded:

Although most stakeholders favoured a continuing role for the federal government (in the ports sector), there was almost unanimous agreement that the CPC no longer has any role to play within a national ports system. As one witness succinctly put it: "Any organization that after 11 years is still trying to define its role, obviously does not have a role." We agree, and the first step towards creating a new framework for our commercial ports must be the elimination of the CPC (House of Commons, 1995).

Financially autonomous Canadian ports will be administered by boards of directors composed of 7 to 11 members: one appointed by the Governor in Council upon nomination by the federal Minister of Transport; one designated by surrounding municipalities; and one designated by the province where the port is located (except for the Port of Vancouver, where one director is designated by British Columbia and another by the three provinces of Alberta, Saskatchewan, and Manitoba). The other directors are designated by the Governor in Council upon nomination by the Minister, in consultation with users chosen by the Minister who fall within user categories listed in the letters patent. All directors are appointed for a maximum mandate of three years, renewable once, after a 12-month waiting period (House of Commons, 1996).

While this reform clearly affords the federal government considerable control over boards of directors (through the power to appoint board members), it can be hoped that ports will enjoy far more flexibility and capacity for initiative. A number of individuals mentioned that the Canada Ports Corporation structure was extremely cumbersome, delaying for several months (if not a year or two) decisions made by port authorities. In view of the rapid changes occurring in the international shipping industry (as noted above), increased autonomy will certainly work to the ports' advantage. In fact, this development is consistent with trends observed in other industrialized countries, where port administration has been delegated to local or regional Chambers of Commerce (or similar organizations), regional governments, or municipalities. In all cases, the objective is the same: give port administrators maximum flexibility so that they can get the most out of the tool they are managing.

As discussed in the *Hickling Report* (House of Commons, 1996), Canadian port reform may entail additional financial burdens for ports, particularly insurance costs and (for those which are not federal port authorities) property taxes. Other factors, however, will help keep port tariffs low: less administrative overhead at a national level, competition between ports, greater user involvement in decision making, and the potential for increased efficiency in port operations. Therefore, the *Hickling Report* concluded that the impact of this reform on tariffs will be neutral in most cases (House of Commons, 1996).

5.2.2 Commercialization of the St. Lawrence Seaway: a world first?

The proposal to entrust management of a high-capacity waterway to a users' group is probably unprecedented internationally. Although private railways and freeways do exist, the common view in most countries is that waterways and navigation facilities should be state-owned or state-managed. Simply suggesting an alternative model represents an innovation.

The federal government does not intend to yield facility ownership, however. The *National Marine Policy* says it best:

Background

- The Great Lakes-St. Lawrence Seaway system is a crucial waterway, but it is also a business.
- The Seaway's long-term survival depends on sustaining healthy traffic levels. To achieve this, it must be a cost-effective and competitive transportation route for the movement of bulk commodities.
- The Seaway needs a management structure that will be more efficient and responsive to users' needs.
- The best way to significantly reduce Seaway costs and improve responsiveness to users is through commercialization. In its report, the House of Commons Standing Committee on Transport found that the Great Lakes-St. Lawrence Seaway system is too costly and needs to be revitalized through increased commercialization.

The Policy

- The Government of Canada will pursue commercialization of the operations of the Great Lakes-St. Lawrence Seaway system.
- Negotiations are currently under way with a group representing Seaway users. Consideration is being given to establishing a not-for-profit private-sector corporation that would operate the Seaway under a long-term agreement.
- Should negotiations be unsuccessful, the Government of Canada will pursue the required changes through other options, such as increased commercialization of the current management of the Seaway.
- In either case, the Crown will retain title to all current Seaway lands and structures.
- Commercialization of the Seaway will not affect federal responsibilities concerning First Nations, including constitutional recognition of treaty rights, nor will it affect current federal agreements or the capacity to negotiate future agreements pertaining to First Nations (Transport Canada, 1995).

The report of the House of Commons Standing Committee on Transport is based on a full review of the Seaway's status at the time the report was prepared (February-May, 1995) (House of Commons, 1995). It covers a number of important points, starting with the problem of financing this facility:

From the beginning, the Seaway Authority was required to be financially self-sufficient and Canada and the U.S. established a tariff of tolls to cover operations and maintenance expenses, interest on loans and repayment of capital over a 50-year period. It soon became apparent that this financial mandate could not be met and by 1977 the Authority's debt had reached \$841 million. In that year the government recapitalized the Seaway through the forgiveness of accumulated interest of \$216 million and conversion to equity of the remaining \$625 million debt. As part of the refinancing, the Authority was directed to ensure that tolls were set at a level which would keep it on a self-sustaining basis.

Since then the Authority has not had to rely on federal funding to operate and maintain the system. It has managed to cover its losses which, because of declining traffic, have been heavy over the past years, through drawing on its financial reserves. However, in 1994, the Authority made a profit of \$10 million due to a substantial increase in traffic. As far as capital expenditures are concerned, a \$175 million structural rehabilitation program for the Welland Canal was financed by the federal government in a form of an increase in its equity (House of Commons, 1995).

The capital spending referred to involved major projects to upgrade the locks of the Welland Canal, which were constructed between 1913 and 1932 (Lasserre, 1980) and are still in their original state. This upgrade became imperative following the collapse of one of the lock walls, which disrupted navigation. The report also notes that the Seaway is vital to the North American economy:

...The Seaway is a national asset. It is of great importance to the social and economic prosperity of the North American heartland. Recent studies demonstrate how essential the Seaway is to the economies of Central Canada and the U.S. Midwest. It is estimated that the Seaway adds Cdn \$3 billion annually and up to 17,000 jobs to the Canadian economy, and \$2 billion and up to 49,000 jobs for the U.S. economy (House of Commons, 1995).

After stating,

... when all is said and done regarding the Seaway, and a lot has been said, to a major degree the Seaway's viability and competitiveness depend upon export grain markets, the health of the steel industry, the global economy, and cost control...(House of Commons, 1995)

the House of Commons Standing Committee on Transport made the following recommendations:

- discontinue the St. Lawrence Seaway Authority through repeal of the *St. Lawrence Seaway Authority Act*;
- establish a financially self-sufficient, not-for-profit corporation to administer the Seaway, including the operation of locks, setting of tolls, and routine maintenance;
- relieve the new operating corporation of all non-marine responsibilities such as bridges and tunnels;²⁰ and
- recognize that the federal government will be responsible for the capital costs of all non-routine maintenance and rehabilitation projects to maintain the safety and integrity of the Seaway (House of Commons, 1995).

Based on these recommendations, the federal government drafted legislation (Bill C-44) to reform the Seaway. On July 15, 1996, it signed a memorandum of understanding with a group of users prepared to establish a private agency to manage the facility. This group consisted of four shipping companies and five stevedoring companies, namely:

- one ocean shipping company (Fednav Ltd.);
- three Great Lakes shipping companies (Algoma Central Corporation, Upper Lakes Group Inc., and Canada Steamship Lines);
- three companies engaged in international trade of agricultural commodities (Cargill Ltd., James Richardson and Sons Limited, and Louis Dreyfus Canada Ltd.); and
- two steel corporations (Stelco Inc. and Dofasco Inc.).

It would be an unprecedented move to confer responsibility for one of the largest navigational facilities in the world on a user group of this kind. Such an innovation would involve an unusual partnership between a group of private corporations and a government. The private sector partners would be responsible for complete day-to-day management of the facility, including marketing and operational efficiency. Government would continue to own the facility, and consequently would be responsible for all non-routine maintenance and rehabilitation work. The two parties will clearly want to establish more precisely the boundary between routine maintenance (the responsibility of the manager) and non-routine maintenance (the responsibility of the owner). In any event, this agreement will create a status for the St. Lawrence waterway that has no parallel among the world's other inland navigation facilities. To illustrate this point, a few examples of waterway management around the world are reviewed. Importantly, the new arrangement will introduce an interesting disparity between North America's two main navigable waterways.

5.2.3 Comparison with other inland waterways

Since the St. Lawrence Seaway is both an international waterway and a meeting place between two fleets (lake boats and ocean-river ships), there is some interest in comparing its planned status with that of the Panama Canal, a major waterway linking

²⁰ The committee is referring primarily to the Seaway International Bridge Corporation (Canada) at Cornwall, the Thousand Islands Bridge further upstream, and the Jacques Cartier and Champlain bridges at Montreal.

two oceans; two international European inland waterways with contrasting legal statuses; and the Mississippi River itself.

The Panama Canal, which was opened to navigation in 1914, is an 82 km long lock-based facility between the Atlantic and Pacific oceans. It provides depths of 12 m (39.5 ft); in addition, the shipping channel is 152.4 m (500 ft) wide at its narrowest point. Vessels must pass through three twinned, back-to-back locks to reach Lake Gatun, and negotiate comparable facilities to drop back to sea level (Panama Canal Commission, 1995).

In 1995 (for the fiscal year ending September 30), 13,631 ocean vessel trips carried 190.4 million long tons (one long ton = 1,016 kg) of cargo traffic. Toll revenues were US \$462.6 million (Panama Canal Commission, 1995). This impressive performance makes the Canal financially self-sufficient; in addition, its revenues are growing steadily.

Therefore, the Canal's status can be respected without any problem. Under the Panama Canal Treaty of 1977 and the *Panama Canal Act* passed by the United States Congress in 1979, American responsibilities with regard to the Canal are delegated to the Panama Canal Commission, an agency of the United States government reporting to the President through the Secretaries of Defence and the Army. The Commission operates under the authority of a nine-member Board of Directors (including five U.S. citizens, appointed by the President with the advice and consent of the Senate, and four Panamanian citizens recommended by the Government of Panama for appointment by the President). Canal management is the responsibility of an Administrator, who must be Panamanian under the terms of the treaty, and a Deputy Administrator, who must be American. Finally, an assistant to the chairman and secretary of the Board of Directors maintains offices in Washington. Under the treaty, this structure will continue until 31 December 1999, at which time the Republic of Panama will take over full responsibility for the Canal. As of that date, the Canal must be in normal operating condition and free from all debt (Panama Canal Commission, 1995).

For the time being (specifically, at fiscal year end 1995) revenues from tolls and other sources (interest and land rent) totalled US \$586 million. All such income is deposited in a special United States Treasury account, the *Panama Canal Revolving Fund*. As at 30 September 1995, US \$216.6 million was available in this fund. In that year, expenses were equivalent to revenues; in 1994, by contrast, there was a net operating profit of US \$1.6 million. While the Commission is entitled to borrow up to \$100 million from the United States Treasury, it borrowed nothing in fiscal years 1994 and 1995.

The commission incurred capital expenditures of US \$38.7 million, including \$9.4 million to expand and align the Canal in the Gaillard Cut. Finally, in the same year US \$275.8 million was paid in wages to 9,120 employees (including 7,577 permanent employees). Of these, 710 United States citizens were paid a total of US \$53.1 million (Panama Canal Commission, 1995).

Therefore, the Panama Canal is managed entirely by a government agency. This situation is unlikely to change: since 1995, a Presidential Transition Commission made up of the four Panamanian members of the Board of Directors of the Canal has been working in Panama to prepare legislation to establish a new Panama Canal Authority for 31 December 1999 (Panama Canal Commission, 1995). The economic and financial outlook for this Canal is excellent. While a number of North American railways offer "land bridges" for the transit of containers between Europe and the Far East, these services do not account for much volume. In addition, financing has not been completed for a new ocean-to-ocean canal project (without locks) across Nicaragua. Therefore, for the time being, the Panama Canal will not have serious competition. On the other hand, the other waterways described for purposes of comparison with the new status for the St. Lawrence Seaway are exposed, as is the Seaway, to keen intramodal and intermodal competition.

The Central Commission for the Navigation of the Rhine (CCNR) manages the largest European inland waterways by far in terms of traffic volume, which is close to 300 MT yearly (277.9 MT in 1991, 270.2 MT in 1992, 273.1 MT in 1993, 284.9 MT in 1994, and 296.2 MT in 1995) (CCNR, *1991-1995 Report*, Vol. 2, Table 7). One of the unique aspects of this traffic is the increase in container traffic carried on barge convoys originating or terminating in the ports of Antwerp or Rotterdam, where cargo is transferred to seagoing ships. The CCNR has just begun to collect data on this containerized traffic: a total of 645,818 TEUs crossed the German-Dutch border at Emmerlich/Lobith in 1994; in 1995, this figure was 653,825 TEUs. These data are not very reliable yet, nor are data for ocean ports: port authorities acknowledge that many containers are transhipped by crane directly from seagoing ships to river boats (or the reverse) without using dock facilities, hence may not be counted. In addition, some river ports do not want to publish figures concerning transhipped containers. In addition, accounting methods have not yet been perfected (CCNR, *1991-1995 Report*, Vol. 2, pp. 12-14). Nonetheless, some 35 percent of river traffic between Rotterdam and Germany is estimated to be container traffic (CCNR, *1991-1995 Report*, Vol. 1, p. 85).

This success is even more remarkable considering that navigational clearances on this 884 km waterway are relatively limited. Available depth varies between 1.60 m and 4.80 m, with a mean of 3.10 m. The width of the navigable channel varies between 82 m and 150 m. Consequently, vessel capacity is fairly modest compared with those available on the St. Lawrence and Mississippi: self-propelled boats on the Rhine have a maximum length of 135 m and maximum width of 22.80 m, for a unit capacity of 3,000 DWT; push-towed convoys may be 270 m long and 34.20 m wide, with a maximum capacity of 13,500 DWT for six barges.

Since the Final Act of the Congress of Vienna in 1815, the Rhine has been an international waterway. A Central Commission is responsible for supervising navigation by applying existing regulations and adapting the regulatory framework to new technological, economic, and political realities. Its operation has been redefined and reworked a number of times, notably by the treaties of Mainz (1831), Mannheim (1868),

and Strasbourg (1963). Its modest operating budget, in the order of FF 10 million (FF 9,649,500 in 1997),²¹ is supported by annual dues from five contracting members of the CCNR, namely, Germany, Belgium, France, the Netherlands, and Switzerland. The United Kingdom used to be a member but withdrew; Austria is expected to join shortly. Dues from member nations, while the CCNR's only income, are sufficient to cover staff and operating expenses at the Secretariat, including the organization of meetings for committees and working groups. CCNR headquarters is located at Strasbourg, at the *Palais du Rhin* (former palace of Wilhelm II from the time of the German Empire), which belongs to the French government. The French government charges no rent to the CCNR and is responsible for maintaining the building and surrounding gardens, while the CCNR is responsible for maintaining its own offices.

Furthermore, all work to maintain and upgrade navigational facilities within a particular member nation is the responsibility of that nation; funding in this regard is provided by the member nation, in addition to its annual CCNR dues. Amounts spent are not communicated to the CCNR and vary widely from nation to nation, since the Rhine is unequally distributed distance-wise among member nations. Therefore, the total operating cost for the Rhine navigable waterway can only be estimated by conducting fairly detailed research at the transport ministries of the five member nations.

This operation of the Rhine facility is reminiscent of the St. Lawrence-Great Lakes system, in that each country sharing the river is fully responsible for capital investment at home. The main differences, however, lie in the existence of a single Commission where each nation has an equal voice, and (above all) the absence of tolls on the Rhine. It may be that the member nations consider that the economic benefits from this intense navigation activity more than make up for taxpayer-supported maintenance costs.

Quite a different regime exists for one of the Rhine's left-bank tributaries, the **Moselle**. Following a decision by the three countries sharing this river (Germany, France, and Luxembourg) to develop it for European gauge navigation (with each nation able to combine this work with construction of hydro-electric plants), a treaty was signed between the three countries in 1956. The *Commission de la Moselle* was established in 1962 according to the principle of exclusive membership by nations sharing the river. Furthermore, the *International Moselle Company* (IMC) was established to oversee financing of work through contributions from each party named in the treaty.

In accordance with joint plans, this work was conducted by each nation within its own boundaries, financed by the IMC. Once work was finished in 1964, tolls were established for commercial navigation [translation] "similar in magnitude to those on the Main and Neckar, in keeping with the economic characteristics of the traffic."²² The Main and Neckar are two right-bank Rhine tributaries that have been developed for navigation as

²¹ Letter from the CCNR Administrator to the author dated May 30, 1997, which forms the basis for much of this paragraph and the next.

²² Section 22a of the treaty between the French Republic, Federal Republic of Germany, and Grand Duchy of Luxembourg regarding channelization of the Moselle, dated 27 October 1956.

well, but do not have the same international status as the Rhine itself. These rivers are located entirely within Germany, and fall entirely under German administration; the Moselle, by contrast, is shared among three countries. It is interesting to note, however, that tariffs already in force on the Main and Neckar were used as a basis for establishing tolls on the Moselle: therefore, all these waterways receive equal treatment with regard to their respective regions.

Traffic on this waterway increased from 4.6 MT in 1965 to some 15 MT in 1990, after the Sarre (a right-bank tributary of the Moselle) was opened to high-clearance navigation in 1988. Coal, hydrocarbons, iron ore, and scrap metal are transported upstream, while grain and other agricultural commodities, steel products, and construction materials dominate downstream traffic. The outlook for traffic growth is positive: close to 20 MT in traffic is forecast for the year 2010. Consequently, the nations sharing this river have decided to deepen the navigation channel by 30 cm, to 3 m, while Germany has proposed doubling up a number of locks within its boundaries.

This traffic generates substantial toll revenue, about DM 21 million per fiscal year in the 1990s. After IMC operating costs (which have declined over the past three years), toll collection costs and lock personnel costs are deducted, the remaining DM 12-13 million is distributed to the three nations sharing the river as an annual lump sum for facilities maintenance and rehabilitation (about DM 10 million to Germany, DM 1.8 million to France, and DM 1 million to Luxembourg). A surplus of DM 1-2 million between 1991 and 1993 was distributed in keeping with Section 20 (1) of the Treaty (payment of interest, repayment of loans and remuneration of share capital at a 3 percent annual rate).

These revenues, however, are not sufficient to cover waterway maintenance costs. According to information provided by the IMC, there was a DM 1.7 million deficit in 1996. In addition, Germany has set aside DM 110 million, and France FF 50 million (75 percent from the central government, 25 percent from the Lorraine region and Moselle department), to deepen the navigation channel. Finally, the two double locks planned by Germany are estimated at DM 85-90 million per project.²³

Despite the international status of the Moselle, therefore, capital projects on the river are paid for by taxpayers of the nations that share it. A similar situation prevails on the Mississippi.

The heavily travelled **Mississippi** (see section 3.3.2. and Figures 9 to 13) is operated under yet another regime. In the early 1980s (the only period in which traffic declined), fiscal policy was adopted that encouraged capital spending for heavy transportation equipment (particularly rail cars and barges). Consequently, there was a surge in available supply on the Mississippi, peaking in 1983 at a fleet of 21,000 barges,

²³ This information is taken from documents and a letter dated 13 June 1997, from Gerhard Nies, Director of the Moselle Commission Secretariat, at Trèves, Germany.

including 1,000 covered barges, 7,800 open barges, and 1,700 tankers. These two factors taken together account for the decline in freight rates and revenues to inland shipping companies (leading to mergers and buy-outs). Freight rates have remained highly volatile, as indicated by the authors of a recent report, who note, "Looking toward the longer term, however, rates might well rise appreciably when the current climate of excess capacity on the river changes." (Lake, Schwier, English, Ghonima, Hackston, 1995)

As traffic recovered in 1986, the United States Congress decided to break with the national policy in effect for 200 years and gradually make users pay for national waterways. Instead of tolls, it established a program of *partial* cost recovery for facility maintenance and modernization in the *Water Resources Development Act*. Under this legislation, such projects (which are carried out by the U.S. Army Corps of Engineers) are financed 50 percent from federal funds and 50 percent from a tax on fuels sold to users of the waterway. This tax rose gradually from 10 cents per gallon in 1986 to 20 cents per gallon in 1997. Revenues from this tax go into the *Inland Waterways Trust Fund*, which covers half of project cost. The other half remains the responsibility of the federal government (Lasserre, 1989). Annual congressional appropriations between 1990 and 1993 for the civil function of the Army Corps of Engineers, following a report by this agency, were US \$1.4-1.5 billion for navigation, \$1.2-1.4 billion for flood control, and \$0.4 billion for general projects (including the previous two items), for a total annual allocation of US \$3.3-3.6 billion (*Statistical Abstract of the United States, 1995*, Table 1082, p. 663). Using this revenue base, the Army Corps of Engineers is planning to widen the Mississippi locks (as discussed in section 3.3.2).

These examples could serve as an inspiration to the government with respect to commercialization of the St. Lawrence Seaway.

5.2.4 Commercialization of the St. Lawrence Seaway: a users' group or bi-national authority?

The examples just given of the Rhine and Moselle, where multinational authorities have responsibility for regulating navigation and co-ordinating facility maintenance and modernization, are clearly relevant to the situation of the St. Lawrence Seaway. As discussed above in section 5.1.2, the federal government is currently weighing two alternatives regarding commercialization of this waterway.

Section 67 of Bill C-44, as tabled in 1996, sets out a number of objectives for reform. Specifically, the legislation seeks to promote a commercial approach to the operation of the Seaway (hence improving its competitiveness), "encourage user involvement in the operation of the Seaway," "protect the significant investment that the Government of Canada has made in respect of the Seaway," "protect the long-term operation and viability of the Seaway," and "encourage new co-operative arrangements with the United States for the management of the transportation facilities and services in the Great Lakes-St. Lawrence region."

There is some question as to whether the two objectives of (1) placing Seaway management in the hands of a users' group and (2) establishing a bi-national authority with a visible commercialization mandate are in fact reconcilable. In some respects at least, the views of the two governments appear to be converging. As part of U.S. President Clinton's objective of improving government efficiency, in March 1996, Vice President Gore identified the St. Lawrence Seaway Development Corporation as one of eight federal agencies targeted for restructuring as a performance-based organization (PBO). More recently, the U.S. Secretary of Transportation announced his support for incorporating "additional private sector characteristics" into this agency and placing it under the management of a chief operating officer (COO) instead of an administrator (*Canadian Sailings*, 1997). In fact, there is some talk of moving the headquarters of this agency from Washington, D.C., to Massena, New York. This city lies just across the St. Lawrence from Cornwall, where the headquarters of a new Canadian agency would be located (Binkley, 1997).

These developments are interesting, in that they indicate that Canada (and perhaps the United States as well) is searching for a *new management model for a major continental waterway*. Assuming that a cost-sharing agreement can be reached between the two countries, this could be the beginning of an unprecedented and fruitful experiment.

5.2.5 The issue of pilotage

Finally, while some in the industry are concerned about provisions in Bill C-44 that affect pilotage on the waterway, the outstanding problems appear to be relatively minor. The legislation confirms the existence of the four existing pilotage authorities (including the two serving the St. Lawrence and Great Lakes). Furthermore, the four authorities are to become financially self-sufficient (as stipulated in the 1972 legislation) and may no longer count on the federal government to pick up any deficit. The real points of friction, however, involve whether or not mandatory pilotage should be enforced based on geographic sector and the qualifications of on-board personnel.

That the pilots are taking a defensive position is completely understandable, given that they are somewhat unsettled by the development of new computerized aids to navigation based on electronic visualization of nautical charts (*Intelnav*) and vessel positioning with respect to these charts, or on permanent, adaptive vessel positioning by satellite (*global positioning system*, or GPS), sometimes accurate to within one metre. These new tools can easily be installed on board a vessel or brought on board by the pilot using a portable computer. Both solutions are affordable,²⁴ and are intended to extend the range of available aids to navigation, not replace existing aids.

²⁴ André Taschereau described these tools in a presentation at the Transportation Development Centre, Montreal, on 25 March 1997.

Shipping companies and navigating personnel are seeking greater flexibility with respect to a number of rules, arguing that the mandatory presence of a pilot is no longer justified on many sections of the waterway, that the qualifications and experience of personnel on board certain Canadian vessels should exempt these vessels from mandatory pilotage, and that the skills of certain seafarers should be recognized sooner with the granting of a pilot's licence or equivalent certificate. There is a problem of access to this profession, which pilots control completely and do not want to give up.

As discussed in section 5.1.2, Bill C-44 only asks the various partners to conduct a joint review of the list of mandatory pilotage zones, standards for issuance of pilots' licences and certificates authorizing captains and officers with recognized experience on board Canadian ships to dispense with the presence of a pilot, and conditions for pilot training. Improved competitiveness of the waterway requires that the partners engage in an exercise of this kind, without compromising safety standards. Pilots may feel some kinship with the federal government, to the extent that both are charged with a mission to ensure the safety of water transport. On the other hand, in view of the changes now occurring (which affect all professions) the pilots may find it worthwhile to forge a genuine partnership with their clients to promote the waterway's competitiveness. It would appear to be a matter of common interest.

5.3 Cost Recovery Measures

As policy in this area is in a state of flux, no definitive comments can be made. On 20 March 1997, Fisheries and Oceans Canada announced a new approach to cost recovery. The original region-based approach to cost recovery backfired somewhat as angry regions (and, especially, user groups) forced the Coast Guard to examine all its costs and, by extension, its entire organization. The Minister recognized this in his press release of 20 March 1997, which announced that the Coast Guard would continue to reduce its own internal costs. The unforeseen effect of this policy, therefore, has been to force a large federal bureaucracy to completely review its organization and cost structure.

While the government was right to retain a team of consultants to attempt to assess the impact of its plans, the consultants' methodology must be taken into account as well. On a number of occasions, the *Hickling Report* warns the reader that *the assessment is only concerned with the short term*, specifically the four years (1996-2000) during which cost recovery will be implemented. In the 20 March 1997 press release, however, the Minister of Fisheries and Oceans misstated the conclusions of this work, stating that [translation] "the results of this study show that, by and large, fees imposed at 1997-1998 levels will have a modest impact." In reality, the executive summary of the report states that many of the new fees will affect companies' profits substantially. The team concluded (and the industry confirmed), however, that all things considered, traffic would not be interrupted

or diverted *within the time frame of the study* (Hickling Corporation, 1996)²⁵. As one of the individuals interviewed for this study put it, a careful reading of this report [translation] “sends up some yellow flags, and several red ones.”

This same concern with methodology arises in the alternative report prepared by a different team for SODES in Quebec City (SODES, 1997). The report points out that the impact of planned measures should be assessed over a longer term than the four years of program implementation, and that the impact of these measures on low-unit-value commodities will be greater than that estimated by the *Hickling Report*. In the case of iron ore shipped from North Shore ports, however, the *Hickling Report* recognizes that the cost of planned measures will reduce the profit margins of Canadian mines (Hickling Corporation, 1996). The authors of the SODES report agree: [translation] “A cost increase of \$0.40 per tonne may accelerate the closing of the Quebec Cartier mine by 2.5 years. This would involve the loss of an estimated \$250 million in fees and other payments, at three levels: federal (\$95 million), provincial (\$125 million) and municipal (\$30 million).” Furthermore, a withdrawal of activities could aggravate the situation for others: “The spiral effect is worse in the winter, because of ice-breaking fees. When one user withdraws because fees are too high, fees go up for other users of marine transport services. One thing would lead to another, as the number of players gets smaller each year.” (SODES, 1997)

It would appear, therefore, that the two reports are not so far apart after all. To be sure, the cost recovery program as proposed by the Coast Guard (with charges by the tonne and not by value) could disrupt the logistic underpinnings of many industries that ship low-value products over long distances. Around the world, the most economical way to do so has always been water transport. It appears that the government authorities are coming to terms with this, and are prepared to review their policy in co-operation with affected industries.

The cost recovery principle does not appear to be an issue. The challenge is to find a solution that all parties can live with.

²⁵ Italics those of the author.

6. CONCLUSION

A number of significant issues have emerged in this review of the St. Lawrence-Great Lakes system.

6.1 The St. Lawrence: a Two-Faceted System

The first issue involves the complexity of this navigation system, which functions both as a major continental gateway and as a valuable tool for inland transportation.

1. *The St. Lawrence is a major continental gateway*: the reference model described in this document to facilitate comparisons has illustrated the advantages of the St. Lawrence system as a continental gateway. The port functions of this gateway are not concentrated at a single location (as is often the case with gateways) but are spread along its shores by a fleet of large ocean-river ships. While North Shore ports downriver are equipped to receive the largest ocean-going bulk freighters, they function as if they were on an island because they have no direct access to rail and highway facilities toward the continent as a whole. Container traffic through the gateway, however, is concentrated at the Port of Montreal, far inland, which enjoys excellent rail and highway connections to the hinterland and exploits a niche characterized by specialized relations with western Europe and the Mediterranean. In addition, the Port of Montreal can accommodate medium-capacity container ships capable of crossing the Atlantic on their own, without transshipment, and of travelling far inland into the continent owing to the exceptionally generous clearances on the St. Lawrence Seaway. Previously, this operation had to be carried out by seagoing ships and river convoys, with transshipment between the two.

Nonetheless, as a result of a major revolution in ocean transport in recent years, the St. Lawrence gateway is increasingly exposed to competition from the entire North American continent. The St. Lawrence faces several major competitors. Notable competitors for container traffic include the ports of the Atlantic seaboard (including Halifax, even though this port is in part an outer St. Lawrence port for this traffic, which is managed and ultimately handled by Montreal); competitors for bulk traffic include western Canada, Churchill (for modest volumes), and the Mississippi.

2. In addition, the St. Lawrence-Great Lakes navigation system is a *valuable tool for inland transport* of large bulk cargoes: not only agricultural commodities that are largely tied to the gateway, but metal ore, coal, hydrocarbons, aggregate, salt, and so on. As such, it is a *basic logistical tool* for industries in Quebec, Ontario, and Great Lakes states and a *decisive factor in the original location decisions* of these industries, in that the system carries much of their raw materials to them and takes away much of their output. As an inland transport tool, however, the system is subject to increasing competition from other transport modes, even if (from a perspective of sustainable development) the system consumes the least energy per

tonne-kilometre and has the least environmental impact in terms of air, water, soil, and noise pollution.

Since the St. Lawrence-Great Lakes Seaway system plays this dual role, the name *Seaway* generally used to describe it is only partially accurate. While this term reflects the system's role as an ocean gateway, it does not reflect the growing competition from other continental gateways and completely overshadows the system's role in inland transportation (which is also subject to growing competition, from other modes). Similarly, it ignores the system's fundamental role in the industrial development of Quebec, Ontario, and the Great Lakes states. A better term, perhaps, would be "water transport system."

This dual role – marine transport and inland transport – should be kept in mind in developing policy on the St. Lawrence – Great Lakes system.

6.2 A Changing Water Transport System

In view of the profound changes in water transport described in this study, all actors must modify their behaviour significantly to take account of increasing competition among ocean ports and among inland transport modes. It is in everyone's interest, therefore, that the St. Lawrence-Great Lakes water transport system change fairly quickly.

In this regard, policies put forward by the Canadian federal government (and ongoing discussions with American authorities regarding management of the St. Lawrence system) will succeed if they make the water transport system more competitive with regard to other continental gateways and inland transport modes, and if they encourage all system participants to realize that they are only links in the chain and that the survival of the chain depends on the competitiveness of each link.

More generally, these policies will be successful if they focus on the often irreplaceable logistical support provided to riverfront industries by the water transport system, and if (in the words of the authors of Bill C-44) they "encourage user involvement" in the operation of the system. By working together to improve the competitiveness of this exceptional system, Canadians will once again be as proud of the Seaway as they were when it was inaugurated.

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