Serving Tomorrow's Mega-Size Container Ships

The Canadian Solution

Michael C. Ircha, PhD
Professor of Civil Engineering
The Transportation Group
University of New Brunswick
Fredericton, New Brunswick
Canada E3B 5A3

Tel: 506-453-4801
Fax: 506-453-4908
E-mail: ircha@unb.ca

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Serving Tomorrow's Mega-Size Container Ships: The Canadian Solution

Continued growth of global containerization has led to the deployment of larger cellular container vessels. Many industry forecasters suggest the next generation of mega-size container ships will be 12,000 to 16,000+ TEU. These massive ships (about twice the capacity of today's largest container ships) will serve only a limited number of deep water or off-shore transshipment hub ports. There are four Canadian deep-water ports that could be considered for on-shore hub port development: Vancouver and Prince Rupert on the west coast, and Halifax and Canso on the east coast. Developing these major hub ports to serve North America's primary container trade are projects of national and international scope. Achieving this vision requires dedicated national and regional task forces to ensure infrastructure is in place, funding available, and legislative constraints eliminated.

Keywords: Seaports; port policy; container terminals; shipping; intermodal systems; pendulum routes

I. Introduction

Contemporary Canadian port reform increased the autonomy of major commercial ports to enable them to be responsive to competitive pressures. The *Canada Marine Act* was adopted by Parliament in June 1998 and implemented in January 1999. Major Canadian commercial ports have now been re-constituted as business-oriented, not-for-profit corporations as Canada Port Authorities (CPA) within a National Port System. Despite this shift towards enhanced commercialization, CPAs are hampered in obtaining financial support from the federal government - an essential ingredient for developing mega-projects such as major container terminals for tomorrow's mega-size container ships.

During the past decade, major ports around the world have faced significant challenges as marine technology and logistical systems have evolved. Two major thrusts impacting ports were the increased specialization of ship design (such as, purpose built cellular container vessels), and growth in ship size. In each case, ports modified their cargo-handling technology and operations and expanded facilities to meet these new demands. In the container trade, specialization meant ports were required to invest in new ship-to-shore quayside gantry cranes, expanded land-side container storage yards, improved and automated container handling equipment, and on-dock rail transfer systems. Today's trend of deploying ever-larger container ships continues to force ports to replace existing cargo-handling systems with longer out-reach post-Panamax gantry cranes and other equipment and, at even greater cost, deepening access channels and water depth at berths. These two thrusts of ship specialization and increasing size are not diminishing.

A third related thrust affecting ports is the development of integrated logistics, reflected by an expanding network of improved inter-modal links based on the 'hub and spoke' system and a rationalization of the overall logistics chain. In the shipping world, integrated logistics led to the establishment of several major alliances and mergers of shipping lines. On the land-side, similar trends can be seen in the acquisitions and mergers of major railroad companies on a continental scale.

The objective of this paper is to evaluate the position of major Canadian container ports with respect to these major thrusts. Each has had an effect on the development of the container trade and the growth of continental competition. Currently, the major trend in the container trades is the development of major hub container ports served by post-Panamax vessels (larger

than the Panama Canal locks) that currently reach 7,060+ TEU (twenty-foot equivalent containers being carried on board). Industry forecasters suggest that these are not optimum sizes and future container ships may well reach 16,000+ TEU capacity. Such large vessels will likely serve only a limited number of strategically located hub ports with container transshipment to and from feeder ports and inland container depots by coastal shipping and intermodal systems (rail and road). Canada's major container ports, Vancouver, Montreal and Halifax, currently handle most of the country's, and some US, international container trade. How will these established ports deal with the changing dynamics of ever larger ships and an evolving global network of strategically located transshipment hub ports? Are there opportunities for other Canadian ports with deep water and intermodal access to serve as future transshipment hub container ports?

II. Containership Evolution

Major commercial ports worldwide have been dealing with the container revolution for many years. As pointed out by Cullinane (1999), containerization has gone through two phases. The first phase to the mid-1980s found ports dealing with four distinct generations of ship size until the Panamax limit of 13 containers across a 32.2 m wide deck was reached. Since the mid-1980s, a second phase emerged that involved an organizational and logistical reorientation towards a totally integrated distribution system coupled with rapid growth in ship size beyond the Panamax limit.

By 1993, other major shipping lines followed APL's earlier lead and began introducing larger and wider post-Panamax vessels. As pointed out by Baird (1999), 'almost three-quarters of the current port-Panamax fleet (i.e. generally vessels of 4000 TEU and above) were built in the 1993-99 period.' In 1997, Maersk introduced its 'S' class of container ships of 7060+ TEU with 17 containers across the deck. These ship sizes are by no means at the limit of future growth. Various industry authorities (Ashar 2000, Baird 1999, Cushing 1999, Damas 2000, Germanischer Lloyd 1998, and de Monie 1998) suggest the next generation of mega-size container ships to be built in five to ten years will be 12000 to 16000+ TEU capacity with up to 22 to 24 containers across a 60 m wide deck and drafts of 15 to 21 m. A number of major ports are already gearing up to meet the challenge of handling mega-size container ships. Charleston has ordered two post-Panamax cranes with an out-reach sufficient to handle 21 containers across the deck, while Felixstowe, Bremerhaven and Rotterdam have ordered post-Panamax cranes with out-reaches capable of handling 22 containers. In its bid to handle such mega-ships, Hong Kong is constructing six deep water berths with a depth of 15.5 m at its new container terminal 9 (Damas 2000).

Larger ships offer considerable economies of scale (increased capacity with higher speeds at lower costs per TEU), greater ship stability, better flexibility in handling containers, and improved reliability (Cushing 1999). However, as ships become larger, the economies of scale decrease (the effect of diminishing returns), but still remain significant. One study of such mega-ships found that the economies of scale justified the deployment of 15,000 TEU vessels on the round-the-world pendulum route serving both the east and west coasts of North America from south-east Asia (de Monie, 2000). A recent Delft Technical University analysis suggests the maximum size for container ships will be 18,000 TEU with a draft of 21 m, given depth restrictions in the Malacca Strait between Indonesia and Malaysia - the major shipping route between Europe and Asia (Gilman 2000).

The world's major container ports will not likely be faced with these maximum sized vessels in the near future. It is expected that over the next five to ten years, shipping lines will consolidate their long haul fleet with vessels ranging from 5,500 to 10,000 TEU. However, the next generation of ships will probably involve a bigger leap to 14,000 - 15,000 TEU capacity to achieve value from diminishing returns in economies of scale (de Monie, 2000). Such ships will likely have twin engines to be able to achieve higher speeds, thus adding considerably to their

cost and the need for significant increases in their container carrying capacity (Gilman 2000).

III. Trade Growth

The use of containers to handle higher value general cargo and other commodities continues to grow. A recent forecast projects world port container throughput growth of 505 to 611 million TEU in 2015 (i.e. 2.4 times 1999 throughput of 210 million TEU). The forecast for North America is for port throughput of 58 to 67 million TEU by 2015 (up from 28 million in 1999) (Ocean Shipping Consultants 2000). As the container trade grows, the ships serving it will become larger. Larger ships require container consolidation at designated hub ports. De Monie (1998) suggested that tomorrow's 'mega-ships' will likely be used on the main east-west global pendulum routes (ending on either coast of North America) calling only at a limited number of off-shore, deep-water ports (rather than at existing on-shore facilities). All containers at these off-shore terminals would then be transhipped by feeder vessels to other ports. Ashar (2000) proposes a more radical approach involving a fleet of 15,000 TEU vessels providing a two way equatorial round-the-world service through an enlarged Panama Canal. This fleet would serve seven strategically located transshipment hub ports, some floating in deeper water. This equatorial east-west routing would find these transshipment hub ports located in the Mediterranean (serving Europe) and the Caribbean (serving North America). Terrassier and Uguen (1999) report that some of de Monie's and Ashar's concepts are coming to fruition as container throughput is rising perceptively in Mediterranean ports located on the main east-west shipping lanes. This increase in the Mediterranean ports contrasts with the relative decline in container throughput in other northern European ports that require significant deviation from the main east-west shipping routes.

I. Implications for Canadian Ports

The challenge for Canada's container ports is to capture the opportunity created by this trend towards deploying increasingly larger container ships. Serving mega-size container ships presents several problems for ports including ensuring: adequate deep water (including environmental concerns related to required dredging), wider channels, deeper berths, suitable high-speed cargo-handling equipment (including longer out-reach post-Panamax sized, quay-side gantry cranes), a highly productive and reasonably priced labour supply, suitable berths for coastal feeder vessels, and good road and rail intermodal connections to inland destinations. Although longer out-reach post-Panamax cranes are being built and delivered to various ports (including Halifax and Vancouver), their longer out-reach could create load limitations due to the terminal's marginal wharf capacity and pile bearings. Such load limitations might lead to additional expensive retrofits. Alternative ship handling arrangements such as providing a slot berth for mega-size container ships to enable post-Panamax cranes to serve both sides of the vessel simultaneously have been proposed. The first slot berth is under construction at the Ceres Paragon terminal in Amsterdam (Champion 2000).

Two of Canada's current major container ports, Halifax and Vancouver, can be considered as potential transshipment hub ports for the next generation of mega-sized container ships. Montreal will likely continue to serve a specific niche providing a short water route from central Canada and the US mid-west to Europe. Depth restrictions in the St. Lawrence River will continue to limit Montreal's accessibility for mega-sized container ships. Other possible contenders as potential transshipment hub ports are the Strait of Canso on the east coast and Prince Rupert on the west coast, both are deep-water ports with good intermodal connections and sufficient land-side storage space to develop new, state-of-the-art major container terminals.

Each of these four ports could provide on-shore major transshipment terminals for mega-size container ships as opposed to off-shore facilities proposed by de Monie and Ashar. There are other US port contenders to consider, particularly now that the US government has approved

major dredging operations in various key hub ports (New York/New Jersey, Oakland). On the West Coast, Long Beach and Seattle have deep water, but lack suitable waterfront land to serve the storage needs of mega-size container ships (Mottley, 1998). The same constraint of limited space for land-side container storage is likely the case in other major east coast US ports.

Canada's east coast offers an ideal terminus for the west-bound pendulum route from Asia traveling through the Suez Canal and the Mediterranean to Eastern North America. Currently, post-Panamax ships serve this route to New York (with a stop in Halifax). Both Halifax and Canso lie relatively close to the main North Atlantic shipping lanes from Europe to New York (with deviations of a few hours sailing time). On the west coast, Vancouver and Prince Rupert both offer good sites to serve as the terminus of the east-bound pendulum route from Asia to North America. Vancouver lies about 4.5 to 6.5 hours sailing time off the main North Pacific shipping lane, while Prince Rupert is about a 2.5 hour deviation.

Halifax

Halifax has recently been a major contender with New York and Baltimore to secure a contract with Maersk/Sea-Land to provide a large container terminal serving their post-Panamax fleet. In the end, Maersk/Sea-Land chose to remain in New York. However, Halifax's bid did serve to raise the port's profile within the shipping community as a location with the potential of serving as a major container facility.

Halifax has ice-free, deep-water berths (14 m) that can be dredged deeper, and a main channel depth of 18 m. Canadian National Railway (CN) provides trunk rail service to the port, serving two competing container terminals (Halterm and Fairview). CN provides intermodal rail links to central Canada, the US mid-west, and Gulf states through its purchase of Illinois Central and marketing agreement with Kansas City Southern Railways. CN's proposed, but recently abandoned, merger with Burlington Northern - Santa Fe Railway had the potential of expanding Halifax's direct rail access hinterland to most of North America. The majority of Halifax' container throughput is shipped by rail to inland destinations. Both of Halifax's existing container terminals provide on-dock rail transfer systems to CN's intermodal service.

Despite its advantages in serving the container trade, the Halifax Port Authority (HPA) had drawbacks in comparison to its major US competitor, New York/New Jersey. These include the lack of a significant local market - Halifax's metropolitan population is about 250,000 compared to the 12 million+ in the New York area. In addition, more than 80% of Halifax' container throughput is received from or destined to inland centres. A further Halifax drawback is the lack of a direct double-stack container train rail link to the major eastern US markets centered around Boston and New York. Moving containers on double-stack trains on CN's mainline to Montreal and then south to these markets would mean considerable delays in getting commodities to their US destinations.

Despite CN's use of efficient double-stack container trains to central Canada and the US mid-west, shipping to and from inland points by rail adds considerable transportation costs for shippers. Currently, Halifax' two container terminals are operating at about 60% of their full capacity (Bellefontaine, 2000). As this surplus capacity is filled over time, the HPA can plan the development of a future container terminal to handle ever larger container ships. Halterm recently received two new post-Panamax gantry cranes to serve this growing trade.

The Maersk/Sea-Land proposal call enabled the HPA (and its many stakeholders) to participate in planning a new major container terminal. Many potential sites were evaluated during the planning process. The optimal site selected by the HPA to meet the bid requirements was a harbour infill project along the present CN mainline in the Bedford Basin. This project entailed extending the foreshore at Rockingham into the Bedford Basin by 300 m and along the shore from the present Fairview terminal by 1000 m to 1300 m. This site would have allowed CN to readily provide spur lines to facilitate on-dock transfer. To meet the bid requirements, the new container terminal would have had to handle 750,000 TEU per year by providing 1800 m of

contiguous berth face (accomplished by merging with Fairview Terminal), provide up to 16 post-Panamax gantry cranes, container storage for 24,000 TEU, on-dock rail service, and 15 m of water depth (Salzano, 1999A).

Supplying a new container terminal to meet the needs of Maersk/Sea-Land or other carriers in the future requires a considerable capital outlay. As a Canadian Port Authority, the HPA is required to obtain its capital funds from the private lending agencies based on current and projected cash flow. The *Canada Marine Act* prevents the federal government from providing direct financial support to ports. The HPA cannot borrow funds by using the federal government's assets (land, in particular) as collateral. Based on the port's cash flow position, the HPA was limited to borrowing a maximum of $25 million (Bellefontaine, 2000). This was a far cry from the $250 to $450 million needed to construct the new container terminal. The *Canada Marine Act's* financial constraints relegated the HPA to a minor participant in the proposal to develop these new container handling facilities. Most of the financial support for future mega-ship container facilities will have to come from other sources - the shipping lines (who tend to be reluctant to invest, arguing for government support), terminal operators, railways and other intermodal operators, municipal and provincial governments, and others. HPA and other major Canadian ports will need to seek modifications to the *Canada Marine Act* to reduce financial constraints being placed on major port development.

Knowledgeable observers have suggested many reasons for HPA's failure to acquire the Maersk/Sea-Land contract. Some of these were the lack of direct, double-stack intermodal links from Halifax to the U.S. North-East (Boston and New York), labour inflexibility (a major post-Panamax facility must operate 24 hours per day, 7 days per week to ensure optimal utilization of expensive ships), and too many competing interests on the waterfront (such as, Halifax Port Authority, Port Development Commission, two private container terminals, three Waterfront Development Commissions, Greater Halifax Partnership, CN, and so forth). In one case, a competing interest submitted its own bid to Maersk/Sea-Land's call for proposals.

Strait of Canso

The Strait of Canso, located about 150 nautical miles northeast of Halifax in Cape Breton provides a unique alternative to the HPA. Its geographic location means Canso is about seven hours sailing time closer to Europe than Halifax and considerably closer in comparison to New York. Canso offers a deep-water, ice free harbour capable of handling the largest container ships. The main harbour is capable of handling Ultra-Large crude oil tankers (500,000 DWT). The Strait Superport is 20 km long, 1.5 km wide and has a limiting depth of 27 m. The area has more than 6,800 hectares of industrial lands available for port development. The Superport is served by the Cape Breton & Central Nova Scotia Railway - a private short line service connecting to the CN mainline at Truro, Nova Scotia. A relatively short spur line would be needed to connect to a potential container terminal and the track to Truro would have to be upgraded to handle double stack container trains.

The advantages of using Canso for a future on-shore container terminal for mega-size container ships are considerable: deep water, ample maneuvering room, large amounts of land-side storage areas, a labour force that has not historically been involved in waterfront unions and thus may be more flexible in their work practices, and reasonable intermodal connections.

The main drawback is that Canso is not an established container handling facility. This means development is on a 'green-field' site with the inevitable start-up problems of a new major operation. These problems are particularly acute with respect to port labour. Operating a modern container terminal requires highly skilled port technicians, hence considerable investment will be required to attract a sufficient number of suitably qualified individuals to the Canso area and providing appropriate training to enable them to operate a major container terminal. Canso is fortunate in having the Province's Nautical Institute close by. This member of the Nova Scotia Community College system should be able to provide the necessary start-up and ongoing training

for the labour force and management of a major container terminal.

Canso could emerge as a major international hub port serving eastern North America. Funding could be provided by an international consortium of major shipping lines or alliances and terminal operators with suitable backing from Canadian and US governments.

Vancouver

Vancouver has become Canada's largest container port, handling over 1 million TEUs in 1999. A good part of its success came from the development of a new container handling facility in deep water (15.8 m) at Roberts Bank in the Strait of Georgia outside the urbanized area. Roberts Bank deep-sea terminal is a 105 hectare man-made island linked by causeway for road and rail connections to the mainland. The facility was constructed by the federal government in the 1970s to serve as a coal and grain handling terminal. In 1997, Deltaport Container Terminal was commissioned at Roberts Bank as a two berth 600,000 TEU facility on a 40 hectare site served by four post-Panamax quay-side gantry cranes. The container terminal is served by road and by both of Canada's main railways - Canadian Pacific and Canadian National - offering double-stack rail services throughout the North American continent.

Deltaport Container Terminal is currently operating at 80% capacity (500,000 TEUs) and expected to reach full capacity by the end of 2000. Present forecasts indicate that Deltaport Container Terminal will be handling 850,000 TEUs by 2007. Plans are underway to convert the grain handling site to an additional 24 hectares of container storage area in three phases to accommodate this growth (Vancouver Port Authority, 2000). However, further expansion is problematic unless Deltaport converts the existing coal terminal to container handling operations. Enlarging Roberts Bank is likely to be cost prohibitive and environmentally difficult.

Vancouver has two additional deep water container terminals: Centerm and Vanterm (both having water depths of 15.5 m). These two terminals have six post-Panamax cranes and other facilities to handle considerable amount of container throughput. However both are located within the inner harbour and surrounded by the City's urban core. This inner harbour location will likely limit the potential for significant growth of these terminals for handling tomorrow's mega-size container ships. Vancouver Port Authority recently established a special task force, comprised of senior port officials, to determine how to increase the VPA's container handling capacity by a further one million TEUs per year (Container task force 2000).

Prince Rupert

Prince Rupert Port Authority is located some 500 nautical miles north west of Vancouver, placing it relatively closer than other North American west coast ports to Asian markets on the great circle North Pacific shipping route. In fact, Prince Rupert is about 30 hours sailing time closer to Asia in comparison to Vancouver. Prince Rupert is served by road and Canadian National Railways with good connections to the North American continent via Prince George and Edmonton. Currently, the CN line is only operating at about 20% capacity, hence it has considerable ability to handle future increases in container traffic on dedicated trains. The rail line from Prince Rupert has the lowest rail grade through the Rocky Mountains of any Canadian rail route. This makes the east-bound rail trip to North American inland destinations less costly and quicker.

Prince Rupert is a Canadian Port Authority and a member of Canada's National Port System. It currently handles about 9 million tonnes of various cargoes, primarily coal, grain, forest products, and steel destined for Asian markets. The port also handles a small volume of containers at its inner harbour Fairview Terminal. Prince Rupert has North America's deepest harbour with a depth of almost 40 m. Thus, it is more than capable of handling mega-sized container ships. The likely location for a major terminal serving mega-size container ships is Ridley Island, located in Prince Rupert's outer harbour. This site offers over 400 hectares of

industrial land for potential development. In addition, Ridley Island is connected to the mainland by causeway and served by both road and high capacity rail. Ridley Island currently has a grain terminal, a proposed sulphur export facility, and a major coal terminal, the latter is capable of handling vessels up to 250,000 DWT with its deep water berths (20 m) (rupertport.com, 2000).

Unlike the proposed siting of a major container terminal on a relatively bare 'green field' site at the Strait of Canso, Prince Rupert offers additional advantages. It is a well established major port, hence it has a well trained and capable work force. Suitable training for the required container terminal workforce could be provided by the North West Community College located within Prince Rupert. On the other hand, similar to Canso, Prince Rupert also offers a 'green field' site suitable for the development of a new major container terminal for tomorrow's mega-sized container ships.

Port Comparisons

Serving the container trade has inherent risks. Shipping lines are relatively mobile and can move their operations to another competing port, leaving a port's major capital investment under-used. The 1987 loss of Asian shipping lines serving Saint John reduced the port's container throughput to a mere shadow of its former traffic levels. As pointed out by J. White, President of the North Atlantic Ports Association, the region faces an unsettled market, 'its getting difficult to tell from year to year, month to month, day to day, who's on what ship and what their calls are' (Salzano, 1999B). In today's dynamic and uncertain environment, care must then be taken to ensure that any facility being developed meets the needs of its primary customers - the shipping lines. The key factors used by shipping lines to select among competing container terminals and ports include: handling costs, quay-side gantry crane performance (number of lifts per hour), ship turn-around time (reducing idle ship time in port to a minimum), berthing windows (ensuring a dedicated berth is available upon ship arrival), deviation times to access the port from the main shipping lanes, and good linkages to an effective intermodal network (Brooks, 1998).

A new major transshipment terminal for tomorrow's mega-size container ships in either Prince Rupert or Canso would have to satisfy most, if not all, of these key factors. Container handling costs in Vancouver, Halifax and Prince Rupert would likely be higher than in Canso given higher wage scales in established terminals. In the Canso situation, new labour practices could result in lower charges and higher productivity. However, such cost advantages might be short lived as local port worker unions would tend to seek wage and benefit parity with workers at other Canadian and US container terminals.

Crane performance in North American ports is in the order of 25 to 30 lifts per hour. During the start-up phase of a major transshipment container terminal at Prince Rupert or Canso, handling rates would likely be lower, but given a new, well trained work force operating modern, automated post-Panamax gantry cranes, the rates should increase to industry levels if not beyond. Increased productivity, including having a dedicated work force willing to work 24 hours a day, 7 days a week, means rapid ship turn-around time. This is a major consideration for shipping lines using vessels that cost more that $US 100 million to build with daily capital and operating costs of $US 44,000 while in port (Gilman 1999). Dedicated berthing times would be required in all major container terminals to avoid any port delays to these expensive mega-size container ships.

II. Serving Tomorrow's Mega-Size Container Ships

As outlined above, four Canadian ports - Halifax, Canso, Vancouver, and Prince Rupert are each suitable contenders for an on-shore container handling facility to meet the demands of tomorrow's 8,000 - 16,000 TEU container ships. Each port offers sufficient deep water, maneuvering room, ice free berths, and access to a continental rail service to satisfy the needs of mega-size container ships. Two of the possible sites, Vancouver and Halifax, are established major container ports

located within larger urban settings. Although the larger urban areas offer a good source of labour and an attractive local market for some of the imports and exports, traffic congestion, competing waterfront development demands, and environmental concerns may limit their potential for significant future growth.

The other two 'green field' sites, Canso and Prince Rupert, offer space advantages but suffer from the lack of an abundant and skilled labour force. In addition, both of these smaller ports may not have the management expertise needed to plan and develop a major transshipment hub container terminal to serve the massive throughput needs of tomorrow' mega-size container ships. However, both ports are located relatively close to the other two established major container ports. There may well be advantages to be gained in cooperating with the established major ports in developing new major container terminals in Prince Rupert and Canso. Such cooperation may require a new organizational structure to allow both Vancouver and Halifax to encompass the other two potential sites within their operational boundaries in a cooperative and coordinating manner. Developing an integrated regional approach that links each pair of ports, may be of considerable benefit to the ports involved, and indeed to all of North America.

On both coasts, the complementary ports of Vancouver and Prince Rupert, and Halifax and Canso are located within the jurisdiction of a single province, British Columbia and Nova Scotia respectively. This fortunate circumstance reduces any possible inter-provincial frictions that could arise in favoring the development of one site *versus* another. From a federal perspective, there may be considerable advantages in promoting the development of the two more remote sites of Prince Rupert and Canso as both are situated within economically depressed areas. Developing major container terminals to serve all North America from Prince Rupert and Canso would stimulate economic development and generate new jobs in these areas of relatively high unemployment.

To truly be competitive with other US east coast ports in achieving hub port status, both Halifax and Canso need a direct double-stack rail line from Nova Scotia to the US north east including Boston and New York. This means Canadian National Railways should enter into suitable operating agreements with other linking railways in Canada and the US to achieve this goal. Considerable capital investment will be required to upgrade track and related infrastructure to handle a high volume of double-stack container trains to the major markets of Boston and New York.

In the Halifax case, the large number of competing interests within the port community initially hampered the HPA's ability to submit a cohesive proposal. For example, CN submitted its own bid to Maersk/Sea-Land. Ultimately, a strong Halifax contingent came together to support the HPA bid. In today's era of transportation system consolidation, alliances and mergers, a port must not appear to be fragmented. In a recent report to Congress, the U.S. Maritime Administration listed the need for coordination as the first of seven strategic issues facing marine transportation (MARAD, 1999). In the MARAD report, stakeholders expressed concerns about the lack of a national vision, fragmented government responsibilities, inadequate information, unclear responsibilities, and overlapping jurisdictions. These same concerns could be voiced about the Canadian marine transportation system at both national and regional levels. There is a growing need to address these issues to rationalize Canada's ports and their supporting intermodal systems. The anticipated development of major container terminals to serve tomorrow's mega-size container ships reflects a clear need for such rationalization. The suggested regional linking of complementary ports (Vancouver and Prince Rupert, and Halifax and Canso) is a good example of appropriate port rationalization to meet national and international goals.

Both Vancouver and Prince Rupert have good rail connections into the North American continent enabling them to move large volumes of containers to inland markets efficiently. Prince Rupert's advantages include its geographical location closer to the main Asian markets. This reduces the sailing time for vessels on the Pacific pendulum route, allowing containers to be shipped inland by rail faster than at Vancouver or at any other west coast port. In addition,

Prince Rupert offers a 'green field' site with ample room for land-side storage - a problem for Vancouver as expanding the Roberts Bank site would likely be both cost prohibitive and environmentally difficult. Prince Rupert's deep harbour, like Canso's deep water, makes it an attractive location for serving as the western mega-hub for tomorrow's generation of container ships.

For any of the four possible on-shore Canadian sites to become designated as mega-hub ports for tomorrow's mega-sized container ships, several major steps are required. In all cases, there must be a clear determination of who will lead the process of container terminal development. There must be a united and well coordinated approach to secure the necessary funding from private and public sources and the support of major shipping alliances. The establishment of these major terminals for tomorrow's mega-size container ships goes well beyond the boundaries of a port authority, a municipality, a province, and indeed, the nation. These are major projects of international scope that will serve an entire continent. Developing them requires commitment and dedication on national and international scale. Hence, despite the federal government's reticence to be involved in port matters (given the constraints of the *Canada Marine Act*), there is a clear need for active federal participation and leadership coupled with strong provincial involvement to ensure that this major opportunity to use Canadian ports to serve the future container handling needs of the continent is realized.

III. Conclusion

There is a significant opportunity for four of Canada's deep-water ports of Prince Rupert, Canso, Vancouver and Halifax to develop major on-shore transshipment terminals to serve the coming generation of mega-size container ships (12,000 to 16,000+ TEU). These ports could provide appropriately sized container handling facilities to serve the North American market as opposed to the off-shore facilities suggested by de Monie and Ashar. Seizing this opportunity requires the effective and skillful coordination of all the major elements within the marine logistics chain. There is a need to provide highly productive container terminals capable of rapidly handling and turning around tomorrow's mega-size container ships. On the east coast, there is a parallel need to stimulate the development of a dedicated, high-speed intermodal double-stack rail connection to the US north-east markets of Boston and New York (complementing the region's current intermodal linkages to the rest of the continent). Although at first glance, the established container ports at Vancouver and Halifax appear to be appropriate sites for these major container terminals, the 'green field' sites at Prince Rupert and Canso may prove to be better choices. In order for the latter to develop there may be significant organizational advantages of linking with the established container ports to gain expertise and create synergies in marketing, management, and port labour training on a regional scale.

But, most important of all, there is a need for clear leadership at the regional and national level to provide direction to achieve this opportunity. A dedicated national task force, supplemented with parallel regional task forces should be established. These task forces should be comprised of suitable representatives of the federal, provincial, and municipal governments, and the key elements in the transportation industry (port, shipping lines, rail and road, and other port users). These task forces should be mandated to coordinate, at the regional, national and international levels, the development initiatives needed to create major transshipment container terminals on each coast and thus ensure there is a united and common goal and direction. These task forces would ensure the intermodal infrastructure is in place, funding sources identified, and legislative constraints (such as within the *Canada Marine Act*) modified to allow these ports to serve tomorrow's container trade in an effective and efficient manner. The benefits of developing appropriate on-shore transshipment terminals to serve tomorrow's mega-size container ships will accrue not only to Canadians but also to the country's North American Free Trade Agreement (NAFTA) partners, the US and Mexico. Canada and the ports involved cannot allow this significant opportunity to pass them by. Appropriate steps must be taken now to ensure

the development of Canadian major transshipment container terminals serving the global east and west pendulum routes become today's reality for tomorrow's trade.

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