

A Decision Tool for Identifying the Prospects and Opportunities for Short Sea Shipping

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1. Introduction

In the United States, as in most of the world, the use of waterborne transportation has been supplanted by other modes as the advent of motorized surface transportation vehicles shifted commerce from water to land. Tremendous infrastructures to support vehicular use emerged, such as the National Highway System in the United States and extensive rail networks in developed countries. Populations have grown enormously in the last century and increased demand has been placed on surface transportation networks, and congestion in major metropolitan areas and on highway and rail systems. Coupled with forecasts for enormous increases in global and U.S. domestic trade, this congestion and the negative impact that it brings, has caused renewed examination of the use of the waterways as a complementary and alternative method of transportation.

The specific study of Short Sea Shipping, as part of this effort, is newer still. Started in the United States by the U.S. Maritime Administration less than two and half years ago, the Short Sea Shipping Initiative is providing a framework to create awareness of the importance of waterborne domestic inland, inter-coastal and intra-coastal, and nearby international services.

This paper addresses the result of a project commissioned by a Port Authority to gain additional information and analysis to consider how short sea shipping should be included in its strategic plans. The consulting group commissioned, decided to develop a decision tool that considers and places weights upon a list of critical decision factors that may support or impede the initiation of a Short Sea Shipping project. The list was developed by considering the industry as a whole with relevance to the specific Port Authority's attributes.

The Short Sea Shipping Decision Tool, which is based on a literature review of current research, analysis, interviews and a series of questionnaires as well as the combined expertise of industry experts led to the identification of a list of critical decision factors that may support or impede the initiation of a Short Sea Shipping at the particular port that was studied. A comparison between the current and future potential scores indicated that Port Authority has the potential to improve their likelihood of initiating a successful Short Sea Shipping initiative if many actions are implemented within many of the sub-categories that were identified as critical through the use of the Short Sea Shipping Decision Tool.

In the next section, we will provide a background to Short Sea Shipping in the US. Section 3 identifies the critical decision factors that support or impede Short Sea Shipping. The development and application of the Short Sea Shipping Decision Tool is presented in section 4 followed by an analysis of the results. A conclusion and discussion of the research is found in section 5.

2. Background to Short Sea Shipping

2.1. What is Short Sea Shipping?

This term is defined as the shipping of cargo or goods for relatively “short” distances or to nearby coastal ports. Typically, Short Sea Shipping vessels follow a coastline, cross a channel or other landlocked geography. There is much debate and no uniform definition that sufficiently describes what Short Sea Shipping is. The U.S. Maritime Administration (MARAD) defines Short Sea Shipping as: “...*commercial waterborne transportation that does not transit an ocean. It is an alternative form of commercial transportation that utilizes inland and coastal waterways to move commercial freight from major domestic ports to its destination.*” (MARAD 2005).

In this paper we view geography as the foremost criteria to defining what Short Sea Shipping is. This is consistent with the MARAD definition, albeit we do not limit the scope of Short Sea Shipping solely to domestic trades but rather to a geographic region, e.g. North America. We consider smaller local/regional ports as part of Short Sea Shipping. Additionally, similarities between inland navigation and Short Sea Shipping do exist; however, it is necessary to emphasize that Short Sea Shipping considers the transport route and not the shipping method itself. Short Sea Shipping can encompass any of the following:

- **Intermodalism** is “used to denote movements of cargo containers interchangeably between transport modes, i.e., motor, water, and air carriers, and where the equipment is compatible within the multiple systems.” (MARAD 2005). It refers to the movement of cargo by more than one mode of transport, including but not limited to: short sea vessel, truck, rail, and inland barge. This mode of transport is most conducive for the future growth and success of Short Sea Shipping.
- **Containers or Trailers** are the instruments of choice for transport of non-bulk or non-break-bulk dry goods. The advent of containerization has facilitated expediency, safety, reliance, and overall cost reductions. Types of services and routes for container and trailer traffic most often used are: transshipments, feeder, coastwise and bridge.
- **Door-to-Door** is the concept of carrying freight from the “door” of the factory or shipper to the “door” of the consignee or receiving factory. Door-to-door services or express traffic is a large component of international and domestic trade. Customs clearance services are handled turnkey and seamlessly on all international shipments.
- **Floating Stock** consists of large volumes of goods that are shipped regularly over long distances within the U.S. This may be a suitable use for short sea vessels, in that, the exporter/importer has large quantities of floating stock thus reducing the need for land-based stock, e.g. petroleum and oil based products.
- **Inter-Regional Cargo** has increased significantly with the establishment of the North American Free Trade Agreement (NAFTA), which eliminated many trade barriers. As a result, short sea vessels are serving an increased number of destinations throughout the region. Additionally, the liberalization of trade barriers under the central theme of globalization has heightened the utility of this transportation mode, particularly since many plants and suppliers have found themselves physically far from their markets. The low cost of transportation has had dramatic effects on the economic landscape. The global supply chain is continuously striving to achieve overall economies of scale where the costs are lower and the transportation faster, ultimately leading to cost savings and added value for the total supply chain.

- **An Alternative to Road Transport** is imperative in many countries, especially in Europe and North America, due to excessive roadway traffic jams and congestion. This is primarily due to ever-growing, large and dense populations and increasing roadway cargo tonnage. Many roads and highways have more than exceeded their maximum capacity levels as a result of this ever-increasing road traffic. An initiative that has been developed to transfer transport modes from roadway to waterway is the Port Inland Distribution Network (PIDN). The PIDN is supported by the Port Authority of New York/New Jersey and focuses on the use of container barge services to serve smaller regional ports within a 400 mile radius of the Port of NY/NJ (Brooks and Frost 2004). Congestion and environmental issues have also heightened the need for alternatives.
- **Border Crossings**, international freight, immigration and customs clearance are often an integral part of Short Sea Shipping, especially in Europe and other locations where high frequency ferry services are operating as a “bridge”, an alternative means of extending the highway across the waterways. Trucks and trailers can be carried on Ro/Ro ships while their drivers can travel on the same vessel and take advantage of onboard passenger accommodations for rest and amenities for relaxation. Some routes also carry cars and walk-on/off passengers.
- **Feeder**ing is “used for local or coastal transport (for carriage of cargo and/or containers) to and from ports not scheduled to be called by the main (ocean) vessel, directly connecting these ports to the main (ocean) vessel” (P&O/Nedlloyd 2005) and is a part of Short Sea Shipping.
- **Transshipment**, “to transfer goods from one transportation line to another or from one ship to another” (MARAD 2005), is frequently used interchangeably with the term “feeder”ing”.
- **The Hub and Spoke Networks** (and related feeder connections) are being fueled by the increase in vessel size and has caused ocean carriers to reduce the number of ports directly served. It shall also be noted that the trucking industry uses the same “hub” model for its terminal networks across the country. Hubs enable lines to effectively serve regional markets where volumes do not warrant direct calls.

New Short Sea Shipping services are being introduced at an increasing pace in the U.S. and between the U.S. and its nearby trading partners. Of particular note are the mounting services provided by Osprey Line and Columbia Coastal, and the expansion of CG Railway’s innovative rail on ship service to Mexico by investing in reconstruction of its two vessels to double capacity and the move from Mobile to New Orleans to provide increased service bolstered by the port’s investment in new facilities for the service.

From the current research and the interviews conducted on carriers and ports in the U.S., there is a widespread opinion that Short Sea Shipping markets clearly exist and that these services are very necessary and will expand. The timeframe for expansion is an issue that garners differing opinions, and for good reason. Some see Short Sea Shipping as a system that must be supported by government funding and rely on that premise for their opinion that links its expansion with outside funding. Other businesses disregard government funding as a necessary means and believe that business opportunities will drive Short Sea Shipping. Nearly all agree, however, that government initiatives, such as that at MARAD, serve business well by heightening the awareness of transportation related problems, issues and alternatives.

3. Factors that Support or Impede Short Sea Shipping

3.1. Factors for Success and Failure in EU Sponsored Projects

In assessing the factors that support or impede Short Sea Shipping, various PACT (Pilot Actions on Combined Transport) projects funded by the European Union were analyzed (see Table 1). The results indicated that a solid business plan which considers both rail and trucking as partners in improving quality of service is a leading factor for Short Sea Shipping Success. The implementation studies also indicate that the presence of carrier supporting initiatives would attract cargo revenue.

Table 1. Success and Failures of Short Sea Shipping projects in Europe 1997-2002

PACT ID #	Successful YES / No	Cost in €	Years	Price	Connect w/ Truck or Rail	Integration of IT	Quality of Service Good?	Negotiation Time	Commitment from Carriers	Labor	Business Model Good?	Interest?	Sustainable cargo?	Type of Study
46	NO	696,423	3		NO		NO							Implem.
19	NO	265,560	2		NO		NO							Implem.
18	NO	500,000	2										NO	Implem.
58	NO	270,000	1								NO			Implem.
60	NO	30,0000	1		NO		NO			NO				Implem.
68	NO	250,000	1									NO		Implem.
74	NO	132,000	1					NO			NO			Implem.
57	NO	400,000	2						NO			NO		Implem.
17	YES	936,600	3	YES			YES							Implem.
22	YES	300,000	4		YES									Implem.
25	YES	110,000	1				YES				YES			Feasib.
27	YES	95,350	1		YES									Implem.
29	YES	75,586	1								YES			Feasib.
32	YES	450,000	3				YES		YES			YES		Implem.
66	YES	514,479	2											Implem.
56	YES	175,000	2		YES	YES	YES				YES			Implem.
67	YES	68,325	2	YES	YES		YES		YES		YES	YES		Implem.
75	YES	700,000	2		YES		YES		YES		YES	YES		Implem.
44	YES	515,000	2				YES		YES			YES	YES	Implem.
47	YES	75,696	1								YES			Feasib.
49	YES	87,283	2								YES			Feasib.
50	YES	134,000	2								YES			Feasib.
Total Sum		€6,781,302												

3.2. Several Actions that are Necessary to Stimulate Short Sea Shipping

Short Sea Shipping has some important disadvantages in comparison with road transport. Therefore several actions are necessary to stimulate Short Sea Shipping. These actions are necessary to improve the quality and efficiency of Short Sea Shipping services and to improve port infrastructure and port efficiency. The most important actions are:

- Integration into multimodal transport chains or networks
- Stimulation of new maritime transport technologies
- Removal of administrative barriers (documents, procedures, custom/immigration, veterinary checks)

- Creation of reliable market data on existing land transportation that could be used with decision making on North American Short Sea Shipping
- Improvement of the image of Short Sea Shipping
- Integration of border crossing systems
- Automation of customs and immigration security systems
- Improvement of transparency in ports, related to tariffs and state aids

The missing link that requires most attention is to convince shippers and forwarders presently using road transport to abandon their sole reliance on road and rail transport and give more serious consideration to alternative modes such as Short Sea Shipping as a backbone for integrated door-to-door transport. Some advantages of Short Sea Shipping in comparison with road transport are:

- Increase national transportation capacity
- Lower energy consumption and better environmental performance in terms of pollution and safety
- Reduction of road congestion
- Possibility of Mid-Lake/Gulf logistics efficiencies
- General availability of space capacity in Short Sea Shipping sea lanes and the possibility to extend it further with few infrastructure costs
- Potential contribution to the development of peripheral regions of the U.S.
- Positive effect on the development of other sectors such as the port sector and the shipbuilding industry

However, there are several structural obstacles to the development of efficient Short Sea Shipping services, which are:

- Regularity of services because of trade imbalances
 - Insufficient integration with other transport modes in the transport chain; Short Sea Shipping can have difficulty in meeting “just-in-time” requirements
 - Vessel performance which leads to a lack of speed when compared to its competitors on U.S. trade corridors, especially highways and roads
 - Susceptibility to inclement weather conditions
 - Difficulties in competitive pricing
 - Administrative barriers because of rather complex documentation and procedures in ports and the veterinary checks
 - Lack of statistical data which make accurate analysis of trade flows between ports and regions difficult; this creates problems both for commercial development and policy making
 - Image problems as short sea services have not been marketed very efficiently and shippers are often not aware of the full range of services available
 - Multi-national jurisdiction environment *
 - Reluctance or resistance by local/regional port communities *
- * Special North American identified issue(s)/problem(s)

- Other key parameters are; logistics, shorter route, drive time and cost savings efficiencies.

There are also problems in the area of port infrastructure and port efficiency:

- Delays in some ports because of the lack of smooth connecting links to inland infrastructure, inefficient port operations and the lack of suitable infrastructure
- Port charges that are sometimes very high and not transparent
- Restrictive labor regulations and practices

In general, the following conditions have to be met to increase the competitive position of Short Sea Shipping:

- Speed
- Reliability
- Quality of service
- Cost-efficiency

4. Methodology on the Development and Application of the Short Sea Shipping Decision Tool at the Port Authority.

4.1. The Methods Used

A methodology provides tools and techniques to solve problems. A researcher either has a fixed aim and has to accommodate the means for getting there, or has fixed means (staff, lab, competence) and tries to find the optimal goals, given the means. A strategy employing two methods (e.g. *literature review, interviews/questionnaire*), was employed in the project.

An intensive review of journals, periodicals, E.U. projects, and other research publications related to the subject area was executed during the initial phase of the research. The purpose was to obtain a firm understanding of existing, future, successful and unsuccessful initiatives, as well as advantages, disadvantages and perceptions in the short sea shipping domain. A series of questionnaires was developed to be conducted on the following: Port Authorities and Terminal Operators, Marine Operators and Motor Carriers. This was followed by personal one-on-one interviews with key decision makers of organizations representing the various above stakeholders were conducted. The collected responses of the various key decision makers compiled and analyzed in relation to the below listed Critical Decision Factors and sub-categories. The below list of Critical Decision factors also includes a brief explanation as to the significance of the factor:

Critical Decision Factors

- Congestion – major concern of the U.S. that Short Sea Shipping can alleviate; specific support includes I-95 corridor congestion concerns, projected growth in the region and existing congestion in surrounding regional metropolitan areas
- Cost – cost involved to initiate any new project must be considered
- Demand – a “must have” for any project
- Economic Development – Local & Regional – Port Authorities have a responsibility to provide economic development within their local and regional area

- Environmental Impact – must be considered by Port Authorities prior to initiating any new ventures
- Financing – necessary for any new venture
- Geographic Location – a major contributing factor to any Short Sea Shipping venture
- Government Funding Programs – can be recommended by Port Authorities as a funding source for potential “partners”, i.e. Marine Operators
- Infrastructure Capability – must have the appropriate infrastructure, services and capabilities in order to provide a seamless and successful Short Sea Shipping operation
- Integration of Transport Modes - a system must be in place that seamlessly processes, stores and reports necessary information
- Intermodal Connectors – must have all of the “links” in place receive and deliver cargo and passengers
- Labor – necessary to have adequate and available labor resources for a successful operation
- Public Support – Port Authorities have a responsibility to their community
- Service Cost – ability to provide competitive pricing
- Transportation Culture – other transportation stakeholders have to support the initiative

The following list identifies the sub-categories of each of the Critical Decision Factors that were considered:

Critical Decision Factors with sub-categories:

- Congestion – level of area congestion; proximity to congested metropolitan areas; alternative to congested ports
- Cost – infrastructure investment; marketing / lobbying
- Demand – shipper / consignee; marine operators; motor carriers; port partners
- Economic Development – Local & Regional – impact on region; job creation
- Environmental Impact – mitigation of existing regional impact; local impact due to increased activity
- Financing – port ability to finance infrastructure needs
- Geographic Location – proximity to trade lanes; proximity to distribution networks; proximity to major markets; proximity to regional catchment areas
- Government Funding Programs – federal; state
- Infrastructure Capability – existing infrastructure; available capacity; depth of water; warehousing; cargo handling equipment; barge service; cargo ship service; container capability; Ro/Ro capability; Ro/Pax capability
- Integration of Transport Modes – IT systems integration
- Intermodal Connectors – highway; rail
- Labor – union; non-union
- Public Support – political, state; residents; businesses

- Service Cost – port cost structure
- Transportation Culture – industry level of acceptance

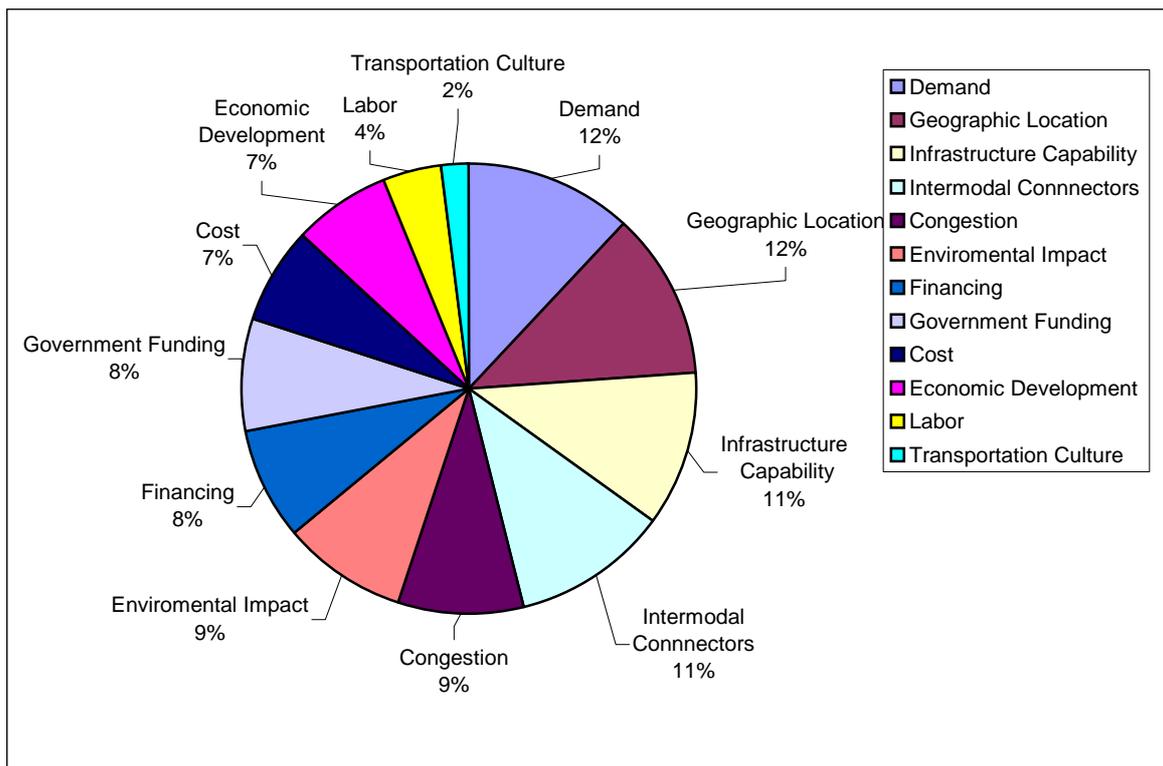
The importance of these factors and their sub-categories are discussed, reviewed and analyzed throughout the study and were specifically considered  relation to the Port Authority studied.

4.2. Short Sea Shipping Decision Tool

The project further proceeds in developing a method to analyze each of the above Critical Decision Factors and to develop a Decision Tool that will assist the Port Authority in their decision to consider proceeding with further research that may lead to the initiation of a Short Sea Shipping project.

After the determination of the Critical Decision Factors and their sub-categories, the next step taken was to weight the importance of each Critical Decision Factor in relation to one another and their contributing factor to the support of initiating a Short Sea Shipping initiative. Whereas all of the factors are important, some of the factors are imperative, while others may not be quite as critical. The weightings were determined and are identified in Figure 1.

Figure 1. Weighting of Critical Decision Factors



Once each Critical Decision Factor was weighted, weightings were also determined for each sub-category within the decision factor. The “Sub-Category Weight” can be viewed in the partial example of the Port Authority Short Sea Shipping Decision Tool at the end of this section. To Be Decided or “TBDs” were used in cases where enough information was not available to make a determination. The factors were not eliminated from the Decision Tool so that the user does not lose sight of the importance of these items for future assessments. An overall “Probability Factor” was then calculated for each sub-category for the entire analysis. The Probability Factor was calculated by multiplying the “Sub-Category Weight” for each sub-category within the Decision Factor by its Critical Decision Factor Weight.

To further develop the Decision Tool and process, the project evaluated the Port Authority's "Present Condition" and "Future Potential" for each sub-category based on the findings from our research, interviews, analysis and expertise. Present condition and future potential scores were assigned as follows:

- 5 – Excellent
- 4 – Very Good
- 3 – Good
- 2 – Fair
- 1 – Poor

A comments column is included in the Decision Tool providing a brief explanation for each sub-category's score. In addition, a column was included ranking the overall importance of each sub-category in relation to the overall analysis as "High", "Medium" or "Low" to assist the user to quickly review the Decision Tool and understand the importance of the item without having to assess all of the factors in the Probability Factor column. In the next page, Figure 2 illustrates a partial example of the Short Sea Shipping Decision Tool.

To conclude the Decision Tool analysis, "Present Probability" and "Future Probability" factors were calculated by multiplying each decision item sub-category's probability factor by its present condition and future potential score. The Present Probability and Future Probability factors were then summarized to determine overall Weighted Average Present Condition and Future Potential scores. The weighted average was then divided by 5 (total possible score) to calculate Current Condition and Future Potential Probabilities.

In review, the process of the Decision Tool is as follows:

1. Identify critical decision factors
2. Identify sub-categories for each critical decision factor
3. Weight the importance of each critical decision factor
4. Weight the importance of each sub-category within the critical decision factor
 - Steps three and four were performed as individual steps in order to better assess the weighting of each sub-category. It would have been too arbitrary to try to weight the importance of all forty sub-categories against one another.
5. Calculate probability factors for each sub-category
6. Score Port Authority's present condition and future potential
7. Calculate present probability and future probability for each sub-category
8. Calculate a weighted average score for Port Authority's overall present probability and future probability
9. Calculate Probability of Success for Port Authority's current conditions and potential future

Figure 2. Partial Example of the Short Sea Shipping Decision Tool

Decision Factor	Importance	Sub-Category Weight	Probability Factor	Present Condition	Present Probability	Future Potential	Future Probability	Comments	Importance
	Highway	High	0.75	0.0825	3	0.2475	4	0.33	Improvement with construction of new bridge
	Rail	Medium	0.25	0.0275	1	0.0275	4	0.11	Based on XYZ Railroad receptiveness to activating intermodal operations
			1.00	0.11					
Labor									
	Union	Low	0.50	0.02	5	0.1	5	0.1	Unions viewed as a political advantage; Not viewed as an operational issue
	Non-union	Low	0.50	0.02	5	0.1	5	0.1	Not an issue
			1.00	0.04					
Public Support									
	Political, State	High	TBD		TBD		TBD		
	Residents	High	TBD		TBD		TBD		
	Businesses	High	TBD		TBD		TBD		
Service Cost									
	Port cost structure	High	TBD		TBD		TBD		
Transportation Culture									
	Industry level of acceptance	High	1.00	0.02	2	0.04	4	0.08	Interviews of motor carriers, R/R & marine operators revealed positive acceptance
			1.00	0.02					
Weighted Average (on a Scale from 5 to 1)									
				1.00					
Probability of Success									

For this project, the Decision Tool was developed at a high level using preliminary and limited data (per the Statement of Work of the project) to determine if the Port Authority should further **consider** Short Sea Shipping as an initiative. As the decision process evolves the tool can be adjusted and perfected to consider lower-level weightings (use of a scale broader than 1 through 5). Additionally, it was determined that the Decision Tool and process that was developed for in the current project could be tailored for use by other industry stakeholders in determining their considerations to initiate a Short Sea Shipping project.

5. Conclusion and Discussion on the Short Sea Shipping Decision Tool

The results of the Short Sea Shipping Decision Tool provided the Port Authority with a new method to consider short sea shipping as a possible component in developing a long and a short term planning strategy. Additionally, the results indicated that Port Authority is well placed to provide needed Short Sea Shipping services in its region if many actions are implemented within the sub-categories identified as critical. The decision to move forward with the efforts that are necessary to further explore this potential will be based on a number of important factors. The demand for Short Sea Shipping services are explored from both the business and public policy perspectives.

From the business or industry perspective, majority of the transportation users and providers did respond with a positive interest in short sea shipping. The majority of marine operators, motor carriers and port partners that were interviewed expressed affirmative inclination to the ability and utilization of the Port operated by the Port Authority as a Short Sea Shipping base. Naturally, specific business opportunities still remain to be explored, and a focused marketing and business plan for Short Sea Shipping would need to be established.

From the policy perspective, there is already significant focus on Short Sea Shipping at national and state levels. Although Federal funding would require further concentrated effort, working with stakeholders such as the I-95 Corridor Coalition, could assist in such activities. An awareness campaign focused on the U.S. Department of Transportation and other political decision makers would also be beneficial.

The continuing industry business, policy analysis and recommendations assist in reducing the impediments to increasing the use of Short Sea Shipping services in the United States. For example, the American Association of Port Authorities, along with over 35 national transportation and business associations and ports, recently adopted a position that repeal of the Harbor Maintenance Tax (http://www.aapa-ports.org/govrelations/hmt_repeal_paper.htm) is necessary to remove this “significant disincentive to coastwise waterborne trade, which could help alleviate surface transportation congestion in the future”. This significant national policy perspective demonstrates the growing concern that this nation cannot build its way out of the current and impending transportation capacity crisis without utilization of a Short Sea Shipping network.

Though the Decision Tool was developed at a high level using preliminary and limited data to determine if The Port Authority should further consider Short Sea Shipping as an initiative, the tool can be adjusted and perfected to consider lower-level weightings (use of a scale broader than 1 through 5), additional research and criteria, cost-benefit analysis and specific scenarios to further refine and decide if a specific Short Sea Shipping project should be initiated.

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