Can Marine Highways Deliver?

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Summary

Policymakers have been discussing the potential for shifting some freight traffic from roads to river and coastal waterways as a means of mitigating highway congestion. While waterways carry substantial amounts of bulk commodities (e.g., grain and coal), seldom are they used to transport containerized cargo (typically finished goods and manufactured parts) between points within the contiguous United States. Trucks, which carry most of this cargo, and railroads, which carry some of it in combination with trucks, offer much faster transit. Yet, at a time when many urban highways are congested, a parallel river or coastal waterway may be little used.

With passage of the Energy Independence and Security Act of 2007 (P.L. 110-140) and the National Defense Authorization Act for FY2010 (P.L. 111-84), Congress moved this idea forward by requiring the Department of Transportation (DOT) to identify waterways that could potentially serve as "marine highways" and providing grant funding for their development. DOT has selected several marine highways for grant funding totaling about $80 million. To be eligible, a marine highway must be an alternative to a congested highway or railroad and be financially viable in a reasonable time frame.

The prevailing perception is that coastal and river navigation is too slow to attract shippers that utilize trucks and that the additional cargo handling costs at ports negate any potential savings from using waterborne transport. While there are other significant obstacles as well, under highly specific circumstances, marine highways might attract truck freight. Freight corridors characterized by an imbalance in the directional flow of container equipment; shippers with low value, heavy cargoes, and waterside production facilities; and connections with coastal hub ports over medium distances may be suitable for container-on-barge (COB) or coastal shipping services. It also appears that marine highways are more suitable to international rather than domestic shippers because the former have lower service expectations.

A review of the successes and failures of the few marine highway services currently operating in the contiguous United States, as well as those that have failed in the past, indicates that the potential market is limited. In many instances, marine highways have succeeded in capturing only a negligible share of container shipments along a given route. One can question, therefore, whether marine highways will divert enough trucks to provide public benefits commensurate with their costs. Congress may also consider repealing a port use charge, the harbor maintenance tax, for containerized domestic shipments as a means of spurring marine highway development. Repealing the tax raises equity issues because waterway users already benefit from reduced federal user charges compared to trucks, and their other competitor, the railroads, are largely self-financed. The Jones Act is arguably another potential statutory hindrance to marine highway development, particularly coastal highways. This act requires that all domestic shipping be carried in U.S. built ships. Critics claim the act raises the cost of domestic shipping to such a degree that it cannot compete with truck and rail.

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Background: Recent Federal Support

For at least a decade, policymakers have been discussing the potential to shift freight from roads to rivers and coastal waterways as a means of mitigating highway congestion. While U.S. waterways carry substantial amounts of bulk commodities, such as grain, coal, and fuel oil, they are seldom used to transport containerized cargo between points within the lower 48 states. Trucks, which carry most domestic container shipments, and railroads, which carry a large proportion of containers imported or exported by sea, offer much faster transit. Yet, at a time when many highways and rail lines are congested, a parallel river or coastal waterway may be little used.

With passage of the Energy Independence and Security Act of 2007 (P.L. 110-140, specifically Subtitle C, 121 Stat. 1760), Congress pushed for greater use of marine transportation by requiring the Department of Transportation's (DOT's) Maritime Administration (MARAD) to identify waterways that could potentially serve as "short sea" shipping routes. Subsequently, in the National Defense Authorization Act for FY2010 (P.L. 111-84, specifically section 3515, 123 Stat. 2724), Congress authorized federal grants for financially viable short sea routes covering up to 80% of total project cost. In April 2010, MARAD issued a final rule implementing the program, along with the following explanation:

> In recent years, it has become increasingly evident that the Nation's existing road and rail infrastructure cannot adequately meet our future transportation needs. Land based infrastructure expansion opportunities are limited in many critical bottleneck areas due to geography or very high right-of-way acquisition costs. This is particularly severe in urban areas where there are additional concerns about emissions from transportation sources.[1]

MARAD uses the term "marine highways" instead of "short sea" shipping to convey the purpose of the program, which is to mitigate landside freight bottlenecks. For this reason, projects relating to waterborne shipment of dry and liquid bulk products and oversize cargo too large to fit into a container are not eligible, as these products already move on waterways. Also, freight ferry service to an island without a bridge is ineligible, because no roadway congestion would be relieved. As specified by Congress, shipments to or from Mexico do not qualify, nor do shipments to or from Canada, except those across the Great Lakes.[2] Project eligibility requires a demonstration of public benefits and long-term sustainability without future federal operational support.[3]

DOT has provided grants to several existing or prospective domestic container shipping services, not only under the Marine Highway initiative but also the Transportation Investment Generating Economic Recovery (TIGER) grant program and the Congestion Mitigation Air Quality Improvement Program (CMAQ), as indicated in **Table 1**.[4] Relative to DOT's total budget, the

[1] 75 FR 18095, April 9, 2010.

[2] See section 55605 of P.L. 110-140.

[3] 75 FR 49017, August 12, 2010.

[4] TIGER I was authorized in the American Recovery and Reinvestment Act (P.L. 111-5) under Title XII, providing $1.5 billion in DOT discretionary grants for DOT; TIGER II was authorized in the FY2010 DOT Appropriations Act (P.L. 111-117). CMAQ is a federal-aid highway program last authorized under P.L. 109-59 (SAFETEA-LU). The Senate Committee Report (S.Rept. 111-69) to the FY2010 DOT Appropriations Act (P.L. 111-117) designates $7 million for the Marine Highway Initiative (the Administration had requested $15 million).

amount of funding is small and could be viewed as seed money for exploring the feasibility of marine highways. The funding recipients are public entities, and can be states, metropolitan planning organizations, or port authorities, which must find other funding sources to cover a share of a project's total projected cost. These entities are encouraged to develop public/private partnerships with vessel owners and operators, truck and rail carriers, and shippers. These projects represent departures from the federal government's traditional role in domestic marine transportation, which has involved financing navigation infrastructure but generally has not provided vessel operating grants or funds for landside marine terminal infrastructure, such as wharves and cranes.

Table 1. Selected Federal Grant Funding for Marine Highway Projects

Project/Service	Description	Funding Grant(s)	Use of Funds
Stockton and West Sacramento Port Upgrades	Reduce congestion on I-580 between Port of Oakland and Stockton and Sacramento, CA, by shifting truck traffic to container-on-barge (COB) service on deepwater ship channels to these ports.	TIGER I - $30 million	Purchase three cranes and one barge, and construct cargo handling facilities at Stockton and West Sacramento; install onshore power source to reduce ship idling at Oakland.
James River 64 Express	Improve COB service between Port of Norfolk and Richmond, VA, to relieve congestion on I-64 (port truckers also use Route 460 south of the river).	Marine Highway - $1.1 million CMAQ - $2.3 million	Purchase two more barges to increase sailings per week to three.
Tenn-Tom COB	Establish COB service between Port of Mobile, AL, and Itawamba, MS, on the Tenn-Tom waterway.	Marine Highway - $1.76 million	Purchase or modify nine barges for new service.
Cross-Gulf Coastal Service	Improve COB service between Brownsville, TX, and Port Manatee (Tampa), FL.	Marine Highway - $3.34 million TIGER II - $9 million	Modify two barges.
Granite City intermodal river port	Construct a new port at Granite City, IL, (St. Louis area) on the site of a former Army base adjacent to the most southern lock (# 27) on the Mississippi River. Not solely targeting container shippers, hopes to attract any kind of shipper.	TIGER I - $6 million	Construct rail track on port grounds and 10 levee relief wells to protect the port from flooding.
Cates Landing intermodal river port	Construct a new port on the Mississippi River in Lake County, northwest Tennessee. Not solely targeting container shippers, hopes to attract any kind of shipper.	TIGER II - $13 million	Construct basic port infrastructure. Land is currently vacant.
Port of Providence Coastal Service	Upgrade container cranes to enable port to handle 1,000 containers per week, relieving congestion on I-95.	TIGER II - $10.5 million	Replace two aged diesel cranes with barge-based electric cranes for handling containers.

Source: U.S. DOT and MARAD press releases, *Journal of Commerce* articles.

Notes: The Marine Highway initiative also provided $0.8 million in funding to study the feasibility of two West Coast services, two East Coast services, and a COB service at Peoria, IL, on the Illinois waterway. TIGER I was authorized in the American Recovery and Reinvestment Act (P.L. 111-5) under Title XII, providing $1.5 billion in DOT discretionary grants, listing port facilities as eligible recipients; TIGER II was authorized in the FY2010 DOT Appropriations Act (P.L. 111-117). CMAQ is a federal-aid highway program last authorized under P.L. 109-59 (SAFETEA-LU). The Senate committee report (S.Rept. 111-69) to the FY2010 DOT Appropriations Act (P.L. 111-117) designates $7 million for the Marine Highway Initiative (the Administration had requested $15 million).

Can Marine Highways Deliver Tangible Benefits?

A prevailing perception is that the slow speed of barges and the additional cargo transfer costs at ports deter use of marine highways. The fact that few containers are transported on such expansive internal U.S. waterway systems as the Mississippi River (including the Illinois, Ohio, and Missouri Rivers) and the Great Lakes suggests that there are deterrents.[5] However, there are also highly specific conditions under which barges might be an attractive option for container shippers. A brief survey of existing and defunct domestic waterborne container services points to specific circumstances in which this could occur. Three market segments can be identified and described as (1) short-distance ferries, (2) upriver inland container-on-barge (COB), and (3) coastal feeder services.

Short-Distance Ferries

Sometimes the shortest distance between two points happens to be over water. A ferry can be a particularly attractive alternative for freight if the overland route requires travel through a heavily congested area. The ferry across Lake Michigan between Ludington, MI, and Manitowoc, WI, which avoids the longer route around the south end of the lake through Chicago, is one example. Another is a ferry across Long Island Sound that allows trucks to travel between Long Island and New England without taking the longer route over bridges in New York City. These ferries carry both cars and trucks. Tellingly, a ferry service between Rochester, NY, and Toronto, Canada, over Lake Ontario did not stay in business for long, in part because it did not save truckers much time compared to the highway route.

The advantage of a truck ferry service is that the transition from land to water and back to land is seamless: the truck drives onto the ferry and then off again, with no separate cargo handling required. Truck ferries demonstrate that marine highways can be successful. However, the geography of the contiguous United States presents few opportunities for cross-waterway ferries.

Upriver Inland Port

Another potential market for marine highways can be identified as upriver inland feeder ports. Several coastal hub ports have satellite ports located upriver that could serve as potential inland container staging areas. Examples are Albany, NY; Richmond, VA; Memphis, TN; Sacramento and Stockton, CA; and Lewiston, ID.[6]

All of these river routes have railroads that parallel them. While river barges carry substantial amounts of lower-value cargoes in bulk and typically offer a lower rate than the railroads, the marine highway concept is predicated on diverting containerized cargo, typically the higher-value cargoes. Shippers of high-value goods are typically willing to pay more for faster transport. Railroads carry about 12 million truck trailers and containers annually, roughly equivalent to the number of containers imported by sea and equivalent to the number of trucks that cross into the

[5] The Port of Montreal is the fourth-largest container port on the North American East Coast. Despite the fact that half of the containers passing through the port have a U.S. origin or destination, none of them travel over the Great Lakes.

[6] Augusta, GA, geographically fits this description as well but there have not been any feeder services on this river for some time nor does there appear to be any discussion of them for the future.

United States from Canada and Mexico. Intermodal rail becomes more competitive as shipment distance increases (starting at distances of at least 500 to 750 miles), because as distance increases, the cost differential between truck and rail widens while the transit time differential narrows. COB services may be more competitive with trucks for shipment distances under 500 miles or so.

The experiences of two defunct upriver inland port services and those of a successful service are helpful in assessing whether this type of marine highway can be successful. The Port Authority of New York and New Jersey began to look for other means of moving containerized cargo to and from its hinterland in order to bypass road, bridge, and tunnel congestion in and around New York City. In April 2003, in cooperation with the port, Columbia Coastal Transport began offering the Albany Express Barge service, a COB service up the Hudson River to the Port of Albany. The service received $5.3 million in federal CMAQ funding, as well as state and local funding, which allowed the barge to undercut the trucking rate by 10%. Upriver to Albany, the barge carried containers loaded mainly with bulk commodities such as logs and silicon, while on the downriver trip it carried primarily empty containers. In addition to the longer transit time (12 to 18 hours by barge versus three hours by truck), the barge sailed only once per week. By the time it ceased operating in February 2006, the barge service had transported a total of 8,486 containers (loaded and empty), or fewer than 30 containers per voyage.[7]

In contrast to the Albany service, the Columbia-Snake River System (465 miles) has a long-established COB service, operating since 1975. Along this river system, containers are loaded with forest products at Lewiston, ID; hay cubes at Pasco, WA; and refrigerated potato and meat products at Boardman, OR. The containers are transferred to oceangoing ships at a marine terminal in Portland, OR, and exported to Asia. The trans-Pacific container carriers offer the barge service as part of a through route, meaning that their customers do not have to make separate arrangements for the barge leg. Three barge operators compete for this cargo and in combination provide frequent service. Barge travel time from Lewiston, ID, to Portland is about 51 hours, versus truck travel time of about eight hours, but the cost of barge transport is roughly 25% less. The container-on-barge services are profitable because the barges carrying containers are included in tows alongside barges carrying petroleum, grain, and other bulk cargoes; container barges would not be profitable as a stand-alone service.[8]

Based somewhat on a similar business model, COB service operated between Memphis and New Orleans on the Mississippi River from 2004 to 2009. Baled cotton (a highly seasonal product) as well as lumber and glucose were loaded in containers and shipped to New Orleans for export on containerships. Barge transit took five days, compared to truck transit of six hours. The service has been discontinued, apparently for lack of northbound cargo.[9] The same carrier tried to establish COB service between Memphis and Louisville, but this also failed.

[7] New York State DOT letter to MARAD regarding the Marine Highway Initiative, dated February 6, 2009. Available at http://www.regulations.gov under docket # MARAD-2008-0096.

[8] Transportation Research Board, National Cooperative Freight Research Program, Report 5, *North American Marine Highways*, 2010, p. 33.

[9] Transportation Research Board, National Cooperative Freight Research Program, Report 5, *North American Marine Highways*, 2010, p. 62.

Characteristics of a Sustainable Container-on-Barge Service

The experiences of the Albany, Columbia-Snake, and Memphis COB operations point to important considerations in judging the viability of marine highways on inland waterways. One is that COB services cater to shippers of lower value, intermediate, or unfinished goods. This is made possible by the significant U.S. containerized trade imbalance. Historically, containerized imports have exceeded exports by a wide margin, especially in the trans-Pacific trade. Exporters can take advantage of otherwise empty containers that are being repositioned to Asia and Europe. Grain exporters, for example, traditionally loaded their commodities in bulk into railcars or barges at inland points and transferred them in bulk to oceangoing vessels at ports, but 6% of U.S. grain exports to Asia moved in containers in 2009.[10] This bolstered demand for COB services. Without the trade imbalance, U.S. exporters of lower-value goods would probably find it too expensive to ship by container, and they would not require container-on-barge services for the inland portion of their export shipments.

Shippers of lower-value goods generally are willing to trade off faster transit times for significantly lower rates (20% to 30% lower is suggested by one study).[11] They also tend to ship heavier cargoes for which over-the-road weight limits (restricting the weight of cargo inside a container or trailer to 44,000 lbs.) keep them from loading containers to their physical capacity (over 60,000 lbs).[12] Container shipment becomes more viable if a shipper is located on the water, not requiring a truck trip to the river terminal. In addition to the cargo transfer costs, each carrier has overhead (fixed) costs that it must recover from each shipment regardless of its distance. Therefore, a shipment involving multiple carriers (for instance, a trucker on one or both ends of a barge movement) will carry more overhead costs than a single-carrier shipment.

COB services may also be more successful if they follow the railroads' example and sell their service to truckers, ocean carriers, or freight arrangers (middlemen) rather than directly to shippers.[13] Many shippers of containerized cargo are used to contracting with just one carrier, which is responsible for door-to-door service even if the transport involves multiple modes. These shippers could be reluctant to arrange for individual legs of a shipment themselves.

Access to backhaul traffic is also important to economic viability, as the Albany and Memphis examples show. The Memphis service may not have been able to capture northbound import loads from New Orleans because import containers tend to be loaded with higher-value manufactured goods whose shippers attach a high value to time; these shippers would rather pay more for rapid truck or rail transportation than pay less for slow and infrequent barge transportation. Also, the New Orleans-Memphis container route faces stiff competition from the Houston-Memphis route. Houston is a preferred container port to New Orleans due to its proximity to the ocean and its more frequent containership service, and containers destined for Memphis can be transshipped by rail or truck from Houston with little or no loss of time. In the case of the Albany COB service,

[10] U.S. Department of Agriculture, Agricultural Marketing Service, *Grain Transportation Report*, December 30, 2010, p. 20, http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5088382.

[11] Transportation Research Board, National Cooperative Freight Research Program, Report 5, *North American Marine Highways*, 2010, p. 3.

[12] For cargoes with high weight-to-volume ratios, container shippers can use a 20-foot container rather than a 40-foot container, but the rate is reduced by something less than 50%. Over-the-road weight limits are higher in Canada, Mexico, and generally overseas.

[13] Intermodal marketing companies, similar to freight forwarders, make the door-to-door arrangements for intermodal rail shipments.

there may have been little available southbound container traffic to New York because the region is not a large producer of agricultural or natural resource commodities for which barge service might be competitive.

As is the case with intermodal rail, shipment density is important to the viability of marine highways. Sufficient volume is necessary so that the water carrier can provide enough service frequency to compete with trucking's scheduling flexibility. If container barges can be incorporated into tows of bulk commodities, customers can be offered more frequent service, which may lead to greater demand.

Prospects for Federally Funded COB Services

The lessons learned from the above services shed light on the prospects for the COB services that have received grant funding. As indicated in **Table 1**, the James River 64 Express barge hopes to expand its service. At the Port of Richmond, VA, container volume has plummeted because the port recently lost the one regularly scheduled transatlantic container line that provided direct service.[14] However, former customers of this line that still require Richmond service may use the James River 64 Express Barge service as a replacement. Unlike the Albany barge service, this may provide the Richmond barge service with a relatively diverse base of customers. Companies producing tobacco products, paper, and quarry stone, all headquartered in Richmond, have expressed interest in the service. The service is predicated on highway, tunnel, and bridge congestion in the Norfolk area. As of August 2010, the James River barge was carrying 100 to 200 containers per week, and has been able to carry loaded containers in both directions. The river transit takes 12 hours while the truck transit takes two hours.[15]

The $30 million in federal funding for the Ports of Stockton and West Sacramento is to promote barge connections with the Port of Oakland. There is no current container service at these upriver ports to build upon. The business plan for the proposed services involves the transfer of cargo between international marine containers and larger domestic containers in Stockton and West Sacramento. The contents of three 40-foot international marine containers can be loaded into just two 53-foot domestic containers.[16] Consequently, some importers and exporters find it economical to pay the additional cost of transferring the cargo between equipment sizes at a warehouse (referred to as "cross docking") in the vicinity of the coastal port so that they can pay for the cost of moving just two rather than three containers overland. For these shippers, the inland transport leg is broken up into two segments: trucking the international container between the seaport and the warehouse where the cross docking occurs, and moving the domestic container between this warehouse and the final U.S. destination/origin. Thus, additional cargo handling operations, often the deterrent to COB service, are essentially negated because these shippers are already choosing an additional transloading step in order to utilize larger domestic containers.

[14] The draft of the James River is 25 feet, so this shipping line used smaller vessels than are typical for trans-ocean containerships. The shipping line is now calling at Wilmington, NC, instead of Richmond, VA.

[15] The issue of whether there is enough freight to sustain both rail and barge container services is especially applicable to the federal funding provided to this marine highway project because federal funding has also been provided to streamline the rail connection and rail corridor leading to the Port of Norfolk.

[16] An "international" container can be shipped domestically, but a "domestic" container is not designed for maritime use. A domestic container is slightly wider than a standard container. A 40-foot international marine container has an internal capacity of 2,390 cubic feet versus 3,850 cubic feet for a 53-foot domestic container or trailer.

A distinguishing feature of the Port of Oakland is that it is an important gateway for containerized exports to Asia. For this reason, it tends to have a relatively balanced flow of import and export containers. However, many of the container cargoes exported through Oakland are temperature controlled agricultural products such as meat. These are time-sensitive, high-value goods that typically move overland by truck because of their high service demands; intermodal rail has not been able to capture much of this cargo even for long-distance shipments. Although, as indicated above, an exporter of refrigerated products uses Columbia-Snake COB services, perishables are not generally considered good candidates for the proposed California barge services.

The Tenn-Tom COB project is also a new service. The service originates at the Port of Mobile, where a new container terminal opened in December 2008. The other terminus is the Port of Itawamba in northeast Mississippi. One expected customer is the furniture industry near the Port of Itawamba. These companies' imports from Asia currently move through the West Coast to Memphis via intermodal rail and then to the factories by truck. Another potential user is Weyerhaeuser, which has two plants in the region and exports to Europe and Asia by truck through the ports of Charleston and Savannah. One hurdle for the new service is that the ports these two potential customers currently use offer much more frequent sailings to Asia and Europe than Mobile does.

As indicated in **Table 1**, the new ports being constructed on the Mississippi River at Granite City, IL, and Cates Landing, TN, are not solely targeting shippers of containerized cargo. These new ports are hoping to attract any cargo, including shippers of bulk commodities. The literature on these projects does not specifically describe potential container shipping customers nor the origins and destinations of cargo traveling through the ports.

Coastal Feeder Service

A third type of marine highway runs between ports along the coast. The cross-Gulf COB service between Brownsville, TX, and Port Manatee, FL, is the only coastal service that received federal funding. The water route between these two ports is about 600 miles shorter than the land route. In 2009, its first year of service, it carried the equivalent of 3,000 containers, or roughly 60 containers per week. The service caters to overweight cargo from Monterrey, Mexico, and, according to the carrier, provides savings of up to $1,000 per container shipment compared with the trucking alternative.[17] It has also been able to find some backhaul cargo.

Another Gulf of Mexico coastal operator, Osprey Lines, used to provide weekly service between Houston and Tampa with a stop at New Orleans on the return trip. It converted an offshore supply vessel, the *Sea Trader*, for container carriage. The *Sea Trader* capitalized on poor rail service between Texas and Florida and the reluctance of truckers to serve this market. However, scheduled coastwise service proved unviable because of a lack of westbound cargo. Ports located on the peninsular part of Florida, like Tampa, primarily serve local markets, and finding backhaul cargo to New Orleans and Houston proved difficult. Osprey Lines currently serves only the Houston-New Orleans route, and only when cargo is available rather than on a regularly scheduled basis.

[17] Transport Topics, *SeaBridge Freight to Launch U.S. – Mexico Barge Service*, November 17, 2008.

Along the West Coast, Matson Navigation provided weekly container shuttle service between Los Angeles, Oakland, and Vancouver, Canada, from mid-1994 to the end of 2000. Unlike most marine highway services in recent years, Matson used a containership in this service. However, when a containership in its Hawaii service had to be replaced, Matson chose the shuttle vessel as the replacement. The shuttle service was only marginally profitable, and rather than acquire another vessel for the service, Matson contracted with a railroad to shuttle the containers.

Columbia Coastal Transport, the company that operated the COB service between the Port of New York and New Jersey and Albany, currently offers twice-weekly service between Norfolk and Baltimore. Its experience suggests that there may be a market for marine highways between hub ports and nearby ports that trans-oceanic containerships prefer to skip. Containership owners prefer to keep their expensive vessels moving by minimizing the number of port calls and avoiding ports that involve lengthy bay or river transits, like Baltimore. Columbia Coastal's barges provide feeder service to Baltimore for international containerships calling at Norfolk. The service carries almost 2,000 containers per week.[18] It formerly offered a similar feeder service between Boston and New York, but abandoned it in August 2010 because more international container vessels began calling at Boston directly.

The enlarged Panama Canal will accommodate larger containerships from 2015. There may be more opportunities for feeder services along the Atlantic and Gulf coasts if more large containerships from Asia call directly at East and Gulf Coast hub ports rather than unloading their cargo at Pacific Coast ports.

Growth Prospects for Marine Highway Services

Marine highway services, with the exception of those across the Great Lakes, cater primarily to the domestic portion of international containerized freight shipments. Domestic shipments are much less likely to use marine highways because, even with highway congestion, shippers are accustomed to relatively consistent on-time performance. Importers and exporters of containerized freight, on the other hand, are accustomed to delays routinely caused by weather, customs, and labor unrest here or overseas. In the context of an ocean voyage lasting two or three weeks, a one- or two-day delay is not unexpected or calamitous.[19]

In addition, a significant portion of domestic truck freight is carried in truck trailers rather than in containers that can be detached from their chassis. Barge services can carry truck trailers, but doing so is relatively inefficient, as trailers, unlike containers, cannot be stacked.

These factors severely limit the potential universe of truck traffic that marine highways could divert from the highways. International shipments account for less than one-tenth of total truck tonnage. The vast majority of the trucks contributing to highway congestion are serving routes or carrying products for which short-sea transport is not a viable alternative, or else are not designed to haul detachable ocean shipping containers.

[18] 73 FR 59531.

[19] U.S. railroads have also found it much easier to meet the needs of international container shippers than of domestic container shippers. The intermodal freight they haul is overwhelmingly part of an import or export shipment.

Vessel and Port Technology

Technological developments have been instrumental in helping railroads compete to carry truck trailers and containers.[20] Proponents of marine highways have suggested that similar developments might occur in the maritime sector, with changes in port or vessel technologies potentially driving down the cost of short-sea shipping. Funding technological development could be an option for promoting marine highways.

One such technology is "fast ferries," ships with speeds of 40 knots or greater, which have been proposed as a way to make coastal shipping more attractive. However, the fuel costs of these vessels could be prohibitive. For shippers, transit time on short-sea routes is much more a function of service frequency than of vessel speed: the need to wait one or two days for a scheduled vessel departure more than cancels out any gain from a faster vessel.

Another technological approach would be renewed emphasis on roll-on/roll-off (Ro/Ro) vessels, which have ramps to allow trucks to drive on and off, leaving just the trailer on the vessel. Ro/Ro vessels first came into wide use during World War II, and at various times have been used for coastal shipping. The advantage of Ro/Ros is that they do not require expensive gantry cranes to load and unload containers and can be loaded or unloaded quickly.[21] However, because the containers or truck trailers carried on the ships have wheels attached, they cannot be stacked on the ship or in the port, making the Ro/Ro concept much less space efficient.

Regardless of ship type, the Matson experience on the West Coast suggests that the capital costs of a dedicated ship can be a difficult hurdle, even in the U.S. coastal container market with the largest volume. Perhaps for this reason, U.S. coastal shipping services typically use oceangoing barges, with a tug either pulling or pushing the barge tow, rather than self-propelled containerships.[22] Crew size requirements are based on the tonnage of a vessel, which in the case of tug and barges is the tonnage of the tug, not the barge. For this reason, tug-and-barge combinations offer substantial savings in crewing costs, requiring crews of six to eight instead of 20 to 23 for self-propelled vessels.[23]

The lesson of avoiding high capital costs seems also to be relevant to cargo-handling equipment in ports. Rather than more expensive gantry cranes, reach stackers appear to be the prevalent means of loading and unloading container barges. A reach stacker is similar to a large fork lift but is mounted with a crane instead of a lift. Reducing cargo handling costs at ports is key to marine highway development.

[20] These developments include the "well-car" that allows for double stacking of containers, articulated cars that reduce cargo damage, and innovations like the "roadrailer" (trailers with both rubber and steel wheels) that has been marketable in specific corridors.

[21] Transportation Research Board, National Cooperative Freight Research Program, Report 5, *North American Marine Highways*, 2010, p. 16.

[22] Ocean barges as well as self-propelled ships are used for shipments between the mainland and Alaska and Puerto Rico, but ocean barges are not used in service to Hawaii; that is, ocean barges are limited to coastal rather than trans-oceanic voyages.

[23] Transportation Research Board, National Cooperative Freight Research Program, Report 5, *North American Marine Highways*, 2010, p. 15.

Issues for Congress

The main issue for Congress with respect to short-sea shipping is whether federal investment in marine highways will produce public benefits that outweigh the costs.

As the above analysis suggests, marine highways may be commercially viable in certain circumstances. In many instances, however, they have succeeded in capturing only a negligible share of container shipments along a given route. There are questions, therefore, whether marine highways will divert enough trucks to provide public benefits commensurate with their costs.[24] For instance, at the height of its service, the Albany Express Barge was diverting 10 trucks a day. To put this number in perspective, the Port of New York and New Jersey handles, on average, about 10,000 containers per day.

Most of the marine highway services that have received federal grants are carrying, or seem likely to carry, no more than a few thousand containers annually. On a per truck basis, therefore, the federal cost of diversion is likely to be in the neighborhood of several hundred dollars. Using the example of Albany Express Barge again, the $5.3 million of federal funding provided for this service enabled the transportation of 8,486 containers over the service's three-year life. This equates to a federal outlay of $625 per container, which is in the neighborhood of what a shipper would pay for trucking a container between New York and Albany. Thus, the federally supported project roughly doubled the nation's freight bill for these container movements.

The Harbor Maintenance Tax

Another means of promoting short-sea shipping would be to repeal the existing harbor maintenance tax as it pertains to containerized domestic shipments, although the tax remains largely unenforced with respect to domestic shippers. The harbor maintenance tax, enacted in 1986, is essentially a federal port use charge intended to recover some of the costs incurred by the U.S. Army Corps of Engineers to operate and maintain waterside infrastructure in coastal and Great Lakes ports. These costs consist mostly of dredging navigation channels, but also maintaining breakwaters and jetties and operating several locks. (The harbor maintenance tax does not recover the Corps of Engineers' costs associated with the infrastructure of the inland waterway system, which is funded from a separate barge fuel tax.[25])

The harbor maintenance tax is assessed at 0.125% of shipment value ($1.25 per $1,000 of shipment value) on imported waterborne and domestic cargo. It is not assessed on waterborne exports, as a 1998 Supreme Court decision found this tax on exports to be unconstitutional. In addition to the amount of the tax, some have claimed that the administrative burden of payment on the part of the shipper discourages would-be waterborne shippers. While highway users also pay federal user charges (taxes on diesel fuel, new truck equipment, and truck weight charges), shippers do not pay these taxes directly; motor carriers do.

[24] Moreover, trucks account for only 8% of highway vehicle miles traveled. For further analysis on congestion and potential solutions, see CRS Report RL33995, *Surface Transportation Congestion: Policy and Issues.*

[25] For further information on the legislative history and implementation of the tax, see CRS Report R41042, *Harbor Maintenance Trust Fund Expenditures.*

Waterborne importers pay the harbor maintenance tax as part of the Customs clearance process upon arrival of the shipment, while domestic shippers pay the tax on a quarterly basis. Domestic shippers are charged only once for each shipment, not at both ports. However, if imported goods are offloaded from a vessel at one port and then shipped to another U.S. port on a different vessel, such as a feeder ship or barge, the tax would be assessed at both ports. The tax thus discourages domestic water shipment of import and export containers.

The tax could also be particularly cumbersome for domestic vessel operators carrying containers of mixed cargo assembled by consolidators, because these typically hold shipments from multiple customers. Before using a marine highway, the vessel operator would need to assure that each shipper was advised that it would be subject to the tax.

In the 111th Congress, bills were introduced that would have exempted containerized domestic shipments from paying the harbor maintenance tax.[26] However, according to preliminary estimates by the Corps of Engineers, only about 10% of what is potentially owed is being collected from domestic shippers.[27] The Corps also estimates that waterborne shippers pay about 10% of the federal cost of providing navigation infrastructure, either through the harbor maintenance tax or the barge fuel tax.[28] This compares with highway user fees (including truck-specific taxes and fees) that cover most of the federal cost of highway infrastructure and railroads, which by and large privately finance their infrastructure. Thus, legislation that further reduces the financial burden on waterway users raises equity and economic efficiency issues with respect to competing modes.

The Jones Act

A long-standing U.S. law commonly referred to as the Jones Act (46 U.S.C. § 55102) requires that only American-built, -owned, and -crewed vessels can operate between two U.S. ports.[29] The law dates back to 1920 and was enacted on the grounds that a domestic maritime industry is necessary for national and economic security.

If not for the Jones Act, domestic containers could be shipped between U.S. coastal ports on existing services provided by international carriers. Foreign containerships carrying U.S. imports and exports already sail frequently between U.S. ports, providing an almost continuous conveyor belt of vessel space along each coast. These ships typically call at three or four ports along a coastal region, and since they generally unload a good portion of the ship's cargo at the first port call, they would have empty space to carry domestic containers to the other U.S. ports on their schedule. However, because they are not in compliance with the Jones Act, these vessels are not allowed to pick up shipments in one U.S. port and unload them at another.

Since the construction cost of U.S.-flag deepwater cargo ships is generally believed to be three or four times that of ships in the world market, the Jones Act may be a significant barrier to

[26] See H.R. 638, H.R. 3486, S. 551, S. 1509.

[27] FY2011 USACE Budget Justification, p. RIO – 66. As a result of a GAO audit, USACE and Customs (CBP) are sharing shipping information in order to improve enforcement of the tax.

[28] John Paul Woodley, Jr., then Assistant Secretary of the Army for Civil Works, press conference announcing the FY2008 USACE Civil Works Budget, February 5, 2007.

[29] The law also requires that they be U.S. owned and crewed. 46 U.S.C. 55102.

domestic shipping in oceangoing vessels.[30] As of year-end 2008 (latest data available), there were 42 active Jones Act-compliant ships suitable for deepwater marine highway service, including 27 containerships and 15 Ro-Ro ships.[31] Of these, 29 (70%) were built before 1984 and thus approaching the end of their useful lives, normally 20 to 25 years for saltwater vessels. The United States is the only industrialized nation that has a domestic build requirement for domestic shipping, and no such requirement exists for other U.S. freight modes. The use of barges in marine highway services is also subject to Jones Act requirements, but the additional construction and manning costs may be less significant than is the case with oceangoing ships.

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[30] The Jones Act applies to Alaska, Hawaii, and Puerto Rico (with an exception for passengers), while other U.S. possessions and territories are partially or fully exempted. The Jones Act carriers serving these markets are under a Department of Justice (DOJ) investigation for price-fixing; several executives from two of the carriers have pleaded guilty with respect to the Puerto Rico trade. Civil antitrust lawsuits are also proceeding.

[31] MARAD, *U.S. Water Transportation Statistical Snapshot* (12/7/09 updated version), p. 18. Dry bulk lakers (47) and oil tankers (51) account for two-thirds of the Jones Act fleet.