Gulf Coast Research Center for Evacuation and Transportation Resiliency

The LSU / UNO University Transportation Center

New Orleans Metropolitan Inland Waterway Container Transport (IWCT) Feasibility Study

September 2011

Final Report

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NEW ORLEANS METROPOLITAN INLAND WATERWAY CONTAINER TRANSPORT (IWCT) FEASIBILITY STUDY

Final Report 11-05

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16. Abstract

The continued growth in freight movements within the U.S land transportation network has reached a point where alternative means of augmenting its capacity should be investigated. Market demand factors such as door-to-door and just-in-time delivery have contributed to the strong growth in both road and rail transport sectors. This heavy reliance on ground transport has resulted in increased traffic congestion, worsened bottlenecks throughout the network, road deterioration, air pollution, highway accidents, and fuel consumption. The integration of the inland waterway network into our current intermodal transportation system could serve as an alternative to long haul freight movements and alleviate some of these negative impacts.

The U.S. Department of Transportation and the Maritime Administration (MARAD) have recently placed new importance on shifting freight movements, particularly containers, to the nation's waterways by creating a priority federal program: North American Marine Highways. MARAD hopes to demonstrate that the nation's inland waterways can serve as an additional transportation system to landside modes for container transport to relieve congestion and reduce demand on landside intermodal connectors and highway infrastructure.

This study has analyzed successful Inland Waterway Container Transport (IWCT) systems in Europe and in select U.S. locations. Further, it assessed the feasibility of IWCT within the Mississippi River trade corridor. The study addresses the potential benefits of IWCT in the US as identified in the literature review, the challenges and limiting factors which have inhibited its development to date, and examines the differences between IWCT development in the US (negligible) and in Europe, where IWCT is a small but rapidly growing and successful sector of certain freight networks. Based on the analysis and findings, the study concludes that IWCT has sufficient landside infrastructure in place or pending to resume service almost immediately. The major hurdles are all market related: unbalanced trade flows; insufficient north bound containers; the absence of a "Multi-Port Complex" with a 1M TEU annual capacity. The project concludes with policies and programs that seek to guide future investment decision-making by the Regional Planning Commission (the Metropolitan Planning Organization for the New Orleans region) as well as the Louisiana legislature and other state departments. The study also highlights the resiliency factors associated with inland waterway transportation at local, state and national levels.

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Executive Summary

Worldwide conditions now exist that could create a positive environment for new transportation modes to serve the Gulf Coast, the New Orleans region, and the entire Mississippi River corridor. Specifically, Inland Waterway Container Transport (IWCT), anchored by a new container "gateway" in the lower section of the Mississippi River, could radically alter international freight movements within the United States. Given the state of the world's recovering economy, the rising cost of fuel, and ever-evolving international trade lanes, the Regional Planning Commission (RPC), in partnership with the Gulf Coast Center for Evacuation and Transportation Resiliency, questioned what impacts these collective forces could have on the existing landside infrastructure supporting international freight movements along both the lower and upper Mississippi River. Although no one can predict the future, with any degree of certainty, the project sponsors wanted to investigate probable futures caused by these dynamics on the movement of international trade through the greater New Orleans region and along the entire Mississippi River corridor. More specifically, RPC wanted to learn what would be needed within their jurisdiction if IWCT emerges as a viable form of transportation in the United States.

This project assumes the following conditions:

- Cargo flows will change due to the expansion of the Panama Canal. The magnitude of the impact on Gulf shipping lanes and ports is speculative.
- An increased volume of inbound containers, estimated at a minimum of one million TEUs, through a Mississippi River Gateway Port, could influence a modal shift to IWCT. This would make the Mississippi River a viable National Marine Highway able to service the transport of containerized cargoes to major inland distribution hubs and Mid-American consumption markets.
- Inland Waterway Container Transport will be supported by federal programs designed to incentivize and influence modal shifts from land to water.

IWCT can create a number of positive outcomes for the Lower Mississippi River region and the entire Mississippi River trade corridor. These include the following:

- Positive economic impacts in the regional maritime sector such as ship design and construction activities utilizing regional shipbuilding facilities.

- The development of "container gateway terminals" at or near the mouth of the Mississippi River.
- New landside support infrastructure investments at upriver sites.
- Diversification of regional port assets such as distribution facilities and value added services.

Existing and proposed terminals located between Southwest Pass and Baton Rouge are included within the study scope as well as upriver inland ports serving the Mid-American consumption markets. The upriver ports are integral parts of two major inland transportation hubs: Memphis, TN and St. Louis, MO. These two metropolitan areas represent the largest transportation and distribution hubs located within the portion of the Mississippi river trade corridor unimpeded by the lock system. They also represent a diverse network of transportation systems that link to all major consumption markets east of the Mississippi River. These areas offer a unique set of diverse transportation assets including Class 1 railroads, interstate highway networks, and inland port facilities. Recently, Fullen Dock, located in the upper Memphis port area, served as the northern most terminal for Inland Waterway Container Transport services offered by Osprey Line.

This report adds to the body of knowledge regarding the success of Inland Waterway Container Transport (IWCT) in Europe. It also identifies best practices in Europe that are applicable in the United States. The report is based on a current literature review of both international and U.S. research into the growth and development of IWCT over the last 40 years. It provides a general overview of containerized transport as a global force in international trade and reviews current U.S. initiatives to accommodate the future growth of this sector. It also reviews potential external forces that may influence the future development of IWCT: specifically the deterioration of the nation's roadway system, negative environmental impacts associated with transportation, escalating fuel costs, and the impacts of congestion and bottlenecking.

The report concludes with a discussion of specific implications for the New Orleans region and the State of Louisiana with recommendations for policy and project initiatives.

Significant findings from the research include:

- Except in limited applications, IWCT is not recognized as a viable mode of maritime transportation in the U.S.

- Near-term expansion of the Panama Canal may create positive dynamics for IWCT along the Mississippi River and its inland tributaries.

- Heavy commodities are a niche market that can be moved in overweight containers via IWCT resulting in less shipping cost per ton versus trucking.

- IWCT could be utilized as a redundant transportation mode in the event of a major road or rail disruption providing increased resiliency to the regional or national transportation network.

- There is currently no "multi-port container gateway system" within the lower Mississippi River in close proximity to the Gulf of Mexico.

- Europe's "container gateway system" ports of Rotterdam and Antwerp, each located within 50 miles of the North Sea with direct access to the Rhine River delta, contribute a critical mass of container cargo into the European river system.

- In both the European and American river systems, major consumption markets are in close proximity to selected inland ports. As evidenced in Europe, it is imperative to develop a "critical mass" of inbound cargoes to sustain IWCT as a viable mode in the U.S.

- Existing terminals located in the New Orleans and Baton Rouge region have varied assets required for IWCT. Some facilities may need to be retrofitted for IWCT.

- The Port of New Orleans has infrastructure in place at its Napoleon Ave. Container Terminal to service IWCT.

- The Port of South Louisiana, specifically at its GlobalPlex facility, has adequate infrastructure available to service IWCT, although on-dock container storage is insufficient at the present time.

- The Port of Baton Rouge includes a 200 acre intermodal shallow draft marine complex at their Inland Rivers Marine Terminal on the Gulf Intracoastal Waterway. This terminal is in close proximity to the Mississippi River and was specifically designed for servicing IWCT.

- Concept terminals have been proposed within the Plaquemines Parish for servicing IWCT. They include: the Louisiana International Gulf Transfer Terminal (LIGTT) located at Southwest Pass at the mouth of the river; SeaPoint, a river transfer terminal envisioned for the East Bank at roughly Mile 12 from Head of Passes; Citrus II, a West Bank land terminal located at approximately mile 53 from Head of Passes; as well as the former AMAX Nickel refinery at milepost 76 from Head of Passes on the East Bank. All four locations are in Plaquemines Parish.

- In St. Charles Parish, within the Port of South Louisiana jurisdiction, there is ongoing discussion about the development of a container terminal at the Bonne Carre Spillway at approximately Mile 127 to 129 from Head of Passes.

- Proximity to distribution markets is a key condition for terminal location.

- After conducting on-site investigations of potential IWCT terminal locations in the lock free portion of the Mississippi River downriver of St. Louis, two prime sites have been identified:

  1) The International Port of Memphis' Frank C. Pidgeon Industrial Park- This site includes 800 acres of undeveloped land suitable for container storage, warehousing and distribution facilities. It is located in close proximity to the recently developed Canadian National Railway (CN) Intermodal Gateway Memphis.

2) The Tri-City Regional Port in Granite City, IL- This port has a partially constructed barge harbor located adjacent to a major Spanish Bio-energy plant. Rail service to this site is currently under construction and improvements to the harbor are in pre-construction stages. Tri-City Regional Port is within 12 miles by truck and rail to the Gateway Commerce Distribution Center located in the eastern portion of the St. Louis Metropolitan area.

- Policy initiatives, at all levels of government, will be necessary to cause a modal shift from existing movements of containers from rail and truck to IWCT. Current IWCT services in the U.S. have been developed and deployed but have been rarely sustained due to insufficient public policy support and financial incentives.

- Various external factors will also be key in causing a modal shift. These include: cost of fuel, air quality regulation, road and rail congestion, port access fees, network disruptions and macroeconomic factors. Policy initiatives by the European Union over the last several decades that address these issues have resulted in significant shifts of container traffic from the rail and road systems to IWCT.

- There is a lack of northbound container loads across all transport systems emanating from the Lower Mississippi River (LMR) region. This has caused previous IWCT services to be suspended or fail. Southbound volumes were sufficient from Memphis. Northbound cargoes from the LMR remained problematic and ultimately caused Osprey's service to be terminated. Similar unbalanced trade flows have caused IWCT services to falter in other locations. Most recently a service using the Snake River to link Portland with inland barge terminals in Oregon has seen greatly diminished levels of traffic.

- A southbound cargo base does exist in non-time sensitive commodities along the Mississippi River trade corridor. They might include:
    - Agricultural Commodities such as specialty grains, cotton and other agricultural products.
    - Industrial Chemicals.
    - Forest Products.
    - Petrochemical Products such as resins and plastics.
    - Metals.

Abstract

The continued growth in freight movements within the U.S land transportation network has reached a point where alternative means of augmenting its capacity should be investigated. Market demand factors such as door-to-door and just-in-time delivery have contributed to the strong growth in both road and rail transport sectors. This heavy reliance on ground transport has resulted in increased traffic congestion, worsened bottlenecks throughout the network, road deterioration, air pollution, highway accidents, and fuel consumption. The integration of the inland waterway network into our current intermodal transportation system could serve as an alternative to long haul freight movements and alleviate some of these negative impacts.

The U.S. Department of Transportation and the Maritime Administration (MARAD) have recently placed new importance on shifting freight movements, particularly containers, to the nation's waterways by creating a priority federal program: North American Marine Highways. MARAD hopes to demonstrate that the nation's inland waterways can serve as an additional transportation system for container transport to relieve congestion and reduce demand on landside intermodal connectors and highway infrastructure.

This study has analyzed successful Inland Waterway Container Transport (IWCT) systems in Europe and existing IWCT services in select U.S. locations. Further, it has assessed the feasibility of IWCT within the Mississippi River trade corridor. The study addresses the potential benefits of IWCT in the US as identified in the literature review. It also explains the challenges and limiting factors which have inhibited the development IWCT to date. Finally, this study examines the differences between IWCT development in the US and in Europe, where IWCT is a small but rapidly growing and successful sector of certain freight networks. Based on the analysis and findings, this study seeks to guide policy and future investment decision-making by the Regional Planning Commission, the Metropolitan Planning Organization for the New Orleans region, as well as the Louisiana legislature and selected departments in state government. The study also highlights the resiliency factors associated with inland waterway transportation at the local, state and national levels.

Preface

This research was conducted and paid for in a partnership effort between the New Orleans Regional Planning Commission (RPC) and the Gulf Coast Center for Evacuation and Transportation Resiliency. Staff of the University of New Orleans Transportation Institute (UNOTI) served as principal researchers.

As a Metropolitan Planning Organization (MPO), the RPC has the distinct advantage of providing a regional perspective on transportation systems. This project will allow the RPC to expand its traditional perspective to include the regions extensive maritime transportation assets. It will also broaden the RPC's perspective on resilient freight transportation modes by utilizing inland waterways as an alternate delivery system. The RPC Transportation Policy Committee's considerations are inclusive of freight movements on the inland waterway system. In order to integrate waterborne freight movements as a component to overall transportation planning, the RPC seeks to better understand the overarching policies as well as the infrastructure requirements that would support the movement of containerized freight within the Mississippi river system. The study demonstrates the social, economic and transportation resiliency benefits that can be achieved utilizing inland waterway container transport (IWTC).

Section 1. Container Transportation: An Overview

A. History

Conventional shipping methods were revolutionized in the mid-1950s with the invention of the shipping container by Malcolm McLean, a trucking entrepreneur from North Carolina. The idea of using standardized shipping containers came to McLean after 20 years of observing the slow and inefficient process of transferring odd sized wooden crates between trucks, ships and warehouses. His idea was based on the theory that efficiency could be improved through the use of a system in which one container, carrying the same cargo, could be transported seamlessly via different modes throughout its entire journey. The standardized shipping container concept also provided a solution to the "high cost of freight handling" since the container could be handled by a single crane operator rather than a team of highly paid longshoremen.

As this popular method of shipping grew, specifically designed vessels were built to allow for the standardized containers to be stacked above and below the decks for easy transfer to trains and trucks at the maritime ports. A major evolution occurred when the original shipping containers that were used were replaced by the International Standards Organization (ISO) container. Today, international containers are manufactured according to ISO specifications with standard fittings and reinforcement norms that are compatible with all international container shipping companies, U.S. and European railroads, and U.S. trucking companies. The most widely used standard 20' and 40' container capacities are measured in twenty-foot equivalent units or TEUS.

TEU Defined:
The standard measure for counting containers is the 20-foot equivalent unit, or TEU. This measure is used to count containers of various lengths. A standard 40-foot container is 2 TEUs, and a 48-foot container equals 2.4 TEUs. This measurement is used to describe the capacities of containerships or ports.
Source: Bureau of Transportation Statistics

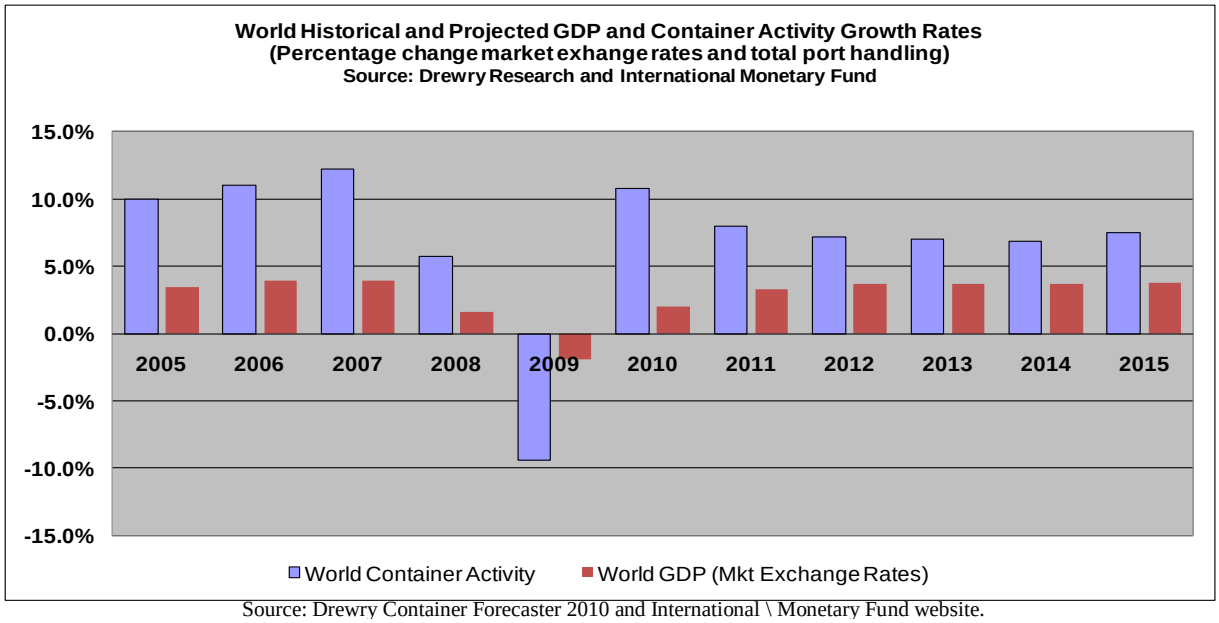
To accommodate these container vessels, today's container ports have and continue to develop and design infrastructure configurations that allow for the most efficient transfer of containers between the ocean carriers and other transport modes. Containerization has revolutionized world trade. It is now possible to load and unload a container vessel in a matter of hours versus days with a conventional cargo vessel in past decades. This increased efficiency and cost savings in labor

handling the vessel's cargo has allowed global trade to grow exponentially over the last 20 years. In addition, containerization and improved intermodal transport networks have improved global distribution efficiency, resulting in a growing share of traditional breakbulk and general cargoes moving in containers.

B. Global Container Growth Projections

Container trade growth responds directly to economic growth patterns. The relationship between the Gross National Product (GDP) and trade volumes is commonly used in forecasting the container shipping sector. According to Global Insights (2008), "Overall, changes to international trade in an economy are an amplified reaction to the dynamics of overall economic growth. When the growth of an economy is accelerating, trade growth will accelerate faster; when the growth of an economy is decelerating, trade growth will decelerate faster." This reactive movement in international trade in relation to economic activity is shown in the Figure 1. It should be noted that many external factors can impact the growth or decline in an economy thus affecting container trade activity. One external factor that has a significant effect on container activity is the fluctuation of exchange rates in world markets. The following figure presents the historical and projected container activity and world GDP over an eleven year period.

Figure 1- Container Activity Growth Rates *vis a vis* World GDP



Source: Drewry Container Forecaster 2010 and International \ Monetary Fund website.

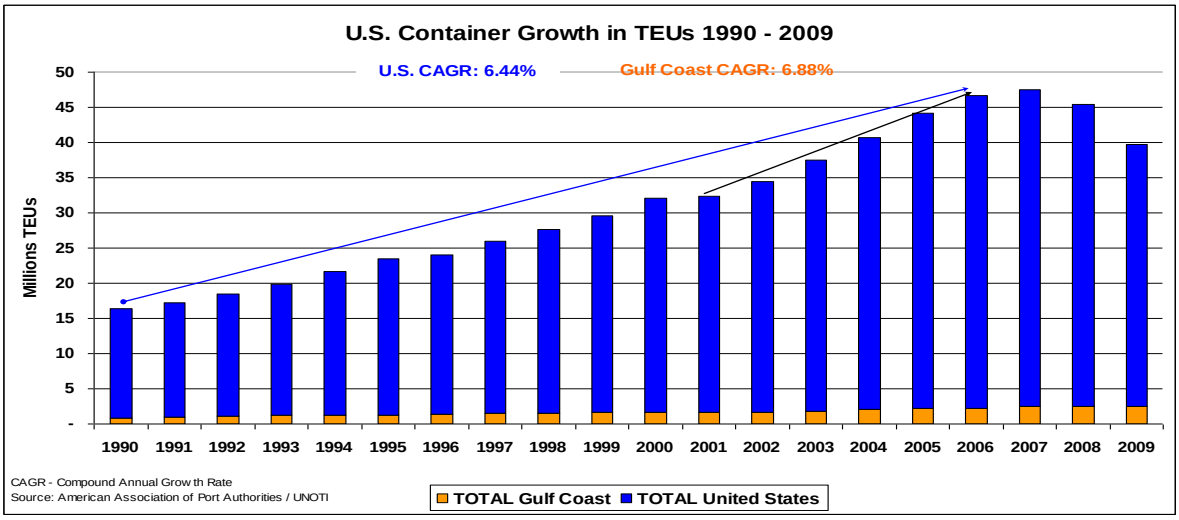
The container market experienced its first annual decline in 2009, falling by 9.4%. This equates to a decline in global port handling of approximately 476 million TEU in 2009 from 525 million

TEU in 2008. Historically, from 2005 through 2007, container activity grew faster than world GDP growth rates. This trend is projected to continue, but at a decreasing ratio of container activity to world GDP, with container trade growing above 5% and world GDP above 3%. The consensus for future container growth is that the double digit growth rates experienced since 2000 will not be achieved in the near future.

C. U.S. Container Growth Outlook and the Gulf Coast Region

The United States continues to recover from a recession, albeit at a slow rate. A survey of forecasters indicated U.S. GDP will grow at a quarterly rate of between 2.4 % and 3.4% over the next ten years, with an average of about 2.8% over the next five years. Based on this forecast, the container trade growth in the U.S. is expected to grow at an annual rate of about 4.5% between 2010 and 2020. Since 1990, overall container trade in the U.S. has grown at a compound annual growth rate (CAGR) of 6.44% from 15.6 million TEUs in 1990 to 45 million TEUs in 2007 (Figure 2). This growth is largely attributed to the entry of China into the World Trade Organization (WTO) in 2001 and the outsourcing of manufacturing activities to China causing a surge in Asian imports to the U.S from 2002 through 2007, followed by a downturn starting in 2009 (Figure 2). Gulf Coast container trade has grown at a CAGR of 6.8 % from 820,000 TEUs in 1990 to 2.5 M TEUS in 2007, keeping pace with the U.S. growth rate.

Figure 2- Container Growth Rates- Total U.S. versus Gulf Coast



Source: American Association of Port Authorities/ UNOTI

The major competing container ports in the Gulf region are Houston and Mobile based on their ability to reach hinterland markets that overlap that of the ports along the lower Mississippi River

region. The Port of Houston dominates the container ports in the Gulf, handling 71% of the total Gulf container volumes in 2009, followed by the Port of New Orleans (PONO) at 9% and Mobile at 4%.

Having the only major container handling facility along the lower Mississippi river, PONO has not experienced comparable container growth rates relative to its neighboring Gulf Coast ports, particularly in Northeast Asian traffic. The findings from a Strategic Advisory Report[1] commissioned by the PONO in 2009 indicates an average growth rate in container volumes of 1%, with base throughput (resulting from natural growth of existing business and excluding prospective new liner services) projected to reach 350,000 TEU in 2028. The report found that the PONO competitive advantage is the availability of inland transportation services for containerized cargo via truck, rail, and the direct access to the Mississippi River barge system. Although not currently utilized as a mode for containerized cargoes, the river system is widely used for the movement of low-value and or hazardous goods. PONO is also disadvantaged by the lack of a large local consumer base and poor proximity to major distribution centers and networks. These two factors tend to attract containerized commodity types.

Section 2. Inland Waterway Container Transportation (IWCT)

History shows that many great civilizations and their trading centers were formed near a sea or river system, given the fact that waterborne transport was the primary means of moving goods and people in ancient times. Today, the maritime shipping sector remains a key transport mode. It is generally accepted that 90% of world trade is carried by sea, and as discussed earlier, demand for seaborne trade is closely linked to global economies (International Maritime Organization 2005). "Without shipping, it simply would not be possible to conduct intercontinental trade. The bulk transport of raw materials or the import export of affordable food and manufactured goods would not be possible– half the world would starve and the other half would freeze!" (International Maritime Organization, 2005).

A vital component of the international transport of containerized cargo is the movement to and from international maritime gateway ports to and from inland origin and destination points. The

[1] Strategic Advisory Report: Napoleon Avenue Container Terminal Development Utilizing Public-Private Partnerships, Parsons Brinkerhoff, June 2009

various modes of inland transport such as road, rail, or waterway occasionally complement or compete with one another in terms of cost, speed, accessibility, frequency and reliability. As container volumes increase at gateway ports the traditional modes of inland transport via truck and rail begin to reach levels that strain the capacity of their supporting infrastructure. This situation is more prevalent on the roadway systems where passenger and freight traffic must co-exist. When a freight transport mode becomes disadvantaged with increased transit times and/or costs over another mode on the same route, a modal shift is more likely to occur. A modal shift also depends on the availability of alternative transport routes that can access the same markets as the competing mode. Inland waterway systems that access key markets can provide a high capacity alternative for longer distance freight transport. Given certain external pressures, a modal shift to Inland Waterway Container Transport could occur.

A. A Literature Review

To date, academic research addressing IWCT issues, particularly as they apply to the United States, is limited. Most available literature consists of previous feasibility studies for specific ports and regions, or only includes IWCT as a minor sub-section within larger discussions of short sea and or intermodal shipping. All sources reviewed identify IWCT as a potentially invaluable freight transportation opportunity, but one which is inherently challenging to implement for several reasons. In the US, IWCT remains very limited, despite years of attempted “proof of concept” initiatives and intermittent federal support. This review addresses the potential opportunities and advantages of IWCT as identified in the literature, describes the challenges and limiting factors which have inhibited its development to date, and examines the differences between the negligible IWCT development in the US and that of Europe, where IWCT is a small but rapidly growing and successful sector of certain freight networks.

The National Cooperative Freight Research Program recently produced a comprehensive report on the state of MARAD’s North American Marine Highways (NAMH) initiative which identifies the issues and research questions currently facing short sea and inland freight shipping, including, but not limited to, container-on-barge. This report provides the most comprehensive review to date of the state of marine freight corridors in the US, and summarizes the findings of other recent literature. Overall, the authors conclude that NAMH has not been ‘fully embraced’ by the freight community,

despite MARAD's support and enthusiasm for the initiative. They also found general consensus that marine freight enhancements provide an environmentally and economically advantageous boost to overall freight capacity.

Other topics addressed in the literature reviewed for this project include the findings of selected feasibility studies conducted throughout the U.S. regarding potential IWCT development, including real and perceived obstacles to implementation, as well as the anticipated benefits. The Port of Pittsburgh Commission's Container-on-Barge Pre-Feasibility Study: Final Report of 2003 includes recommended strategies for overcoming the problems identified. Finally, three other articles (Konings and Maras 2010; Perakis and Denisis 2008; and Weigmans 2005) also address obstacles to and potential opportunities of IWCT. Additionally, these writings illuminate some of the differences between the US and the successful intermodal freight policies and networks of Europe.

Inland Waterway Container Transport: Background and Current Status

Barges can typically cover about one hundred miles per day, making them slower than self-propelled vessels, but in the case of the Mississippi River, barges are uninhibited by any locks or dams downstream of St. Louis (Southeastern Ohio Port Authority 2008). Barge transportation includes several subsectors such as dry bulk (gravel, coal and agricultural products); liquid bulk in the form of tankers; 'general cargo' large and semi-manufactured items; trucks, trailers, machines, etc driven on and off of barges called "Ro/Ro"; and containers (Weigmans 2005).

Dry bulk shipping represents the majority of barge transport used in the US. Shipping containers through inland waterways has been discussed for decades, but in the U.S., this particular mode of maritime transportation has been relatively unsuccessful. The Osprey Line, operating out of Houston, Texas since 2002, is the Gulf Coast and Mississippi River's only extant IWCT operator (although service to Memphis was discontinued in November, 2009), with service potentially connecting Houston, New Orleans, Memphis, and other intermediate Gulf Coast and inland ports. The company claims to have transported more than 70,000 containers between 2006 and 2008 (Southeastern Ohio Port Authority 2008). However, IWCT service has been largely discontinued over the last two years, and the company's website now lists only a regular weekly service from Houston to New Orleans, with an "inducement based service" for other port pairings (RNO Group 2010). The development of a transshipment terminal port, SeaPoint, at mile twelve of the Mississippi

River near Venice, LA to transfer containers from ocean-going ships to river barges has been under investigation for several years (Southeastern Ohio Port Authority 2008). More recently, the Louisiana International Gulf Transfer Terminal (LIGTT) has been proposed as another option for servicing mega-ships at the mouth of the Mississippi River at Southwest Pass. This terminal would transship containers from post Panamax ships to smaller feeder vessels destined for port destinations within the Gulf of Mexico and inland ports within the Mississippi river system. Both projects, to date, remain unrealized.

Opportunities and Advantages of Inland Waterway Container Transport

The NCFRP Report noted that barges typically require smaller crews, lower construction and maintenance costs, and lower dry docking fees than self-propelled vessels. Researchers also found that under certain circumstances, such as peak period landside travel times and associated congestion points or bottle necks, river barge container service can successfully compete with other modes. They can also help correct cargo imbalances and 'one-way' traffic by combining container service with conventional bulk commodity transport. They can create a container service for otherwise cargo-less return trips. (Kruse and Hutson 2010; McCarville 2003).

Table 1: Fuel Usage Comparison: Barge, Rail, and Truck

Mode	Number of Units Required to Transport 456 Containers	Barrels of Oil Used
Barge	1 Barge	75
Rail	228 Rail Cars, double stacked	300
Truck	456 Trucks	645

Source: U.S. Department of Transportation, Maritime Administration (quoted in Southeastern Ohio Port Authority 2008)

This report also concluded that, contrary to common belief, marine highways can be economically viable at short, intermediate, and long distances: there is no 'critical minimum distance' required for success (Kruse and Hutson 2010). Weigmans (2005) also cites the unique ability of barge transport to double as "floating warehouses" when needed, and to quickly facilitate direct transfers of goods from deep-sea ships to smaller barges for distribution. The Southeastern Ohio Port Authority (2008) also found that inland river shipping is considerably more cost-effective

than either rail or truck transport, despite the longer shipping times required. In many cases, delays in shipping yards due to congestion, known as "dwell time" which averages six to seven days at major US ports, exceed the difference in travel time by barge (Perakis and Denisis 2008). Moreover, for the majority of cargoes, the reliability of service, the ability to get the cargo to its destination on time, every time, is much more important than overall shipping speed (McCarville 2003; Perakis and Denisis 2008; Kruse and Hutson 2010). If barge service is reliable, it can effectively compete with faster, less reliable modes.

Challenges and Limitations of IWCT

To date, the development of successful IWCT in the United States has been problematic and limited. The simplest and most important reason is that the underdeveloped IWCT industry has not been able to be cost-competitive with other modes for overall door-to-door service (Kruse and Hutson 2010; Konings and Maras 2010; McCarville 2003; Perkasis and Denisis 2008; Southeastern Ohio Port Authority 2008). Analyses of IWCT services concludes that its fundamental limiting condition is a "chicken and egg" problem: barge service will not be developed until there is a guaranteed demand for it, while shippers are not willing to commit to barge service until it is fully developed and proven to be effective (Konings and Maras 2010; McCarville 2003; Southeastern Ohio Port Authority 2008). This dilemma is a result of a complex combination of policy, technical, infrastructural, organizational and/ or management issues.

Part of the problem is political, stemming from port fees and the Harbor Maintenance Tax (HMT) on cargo value which are assessed to shippers who use maritime transport. These added costs for IWCT in the U.S. enable truckers to consistently undercut marine shipping's operating costs (Kruse and Hutson 2010; Perakis and Denisis 2008). Further, the trucking industry has tended to view marine highway development as competition, rather than as an opportunity to create partnerships (as the industry has done with rail interests) to develop a regular short-haul market for intermodal door to door services (Kruse and Hutson 2010). Modifying government policies and tax structures to create a more favorable environment for IWCT and intermodal cooperation may be critical to the growth and success of this transport mode (Kruse and Hutson 2010; Weigmans 2005). Perakis and Densisis (2008) describe the overall negative attitude among shippers toward IWCT as an "image problem" which can be corrected through better policy, research, and marketing.

According to the NCFRP Report (Kruse and Hutson 2010), key technical obstacles to success have included: (1) a failure to use vessels matched to market needs and (2) an overreliance on too few vessels per operation. Start-up IWCT shippers have been unable to access the types of vessels and barges needed to develop cost-effective service such as several smaller vessels for low-volume, high-frequency service, due to their high cost and low availability. This problem is partially attributable to the Jones Act, which requires all domestic vessels to be built in the United States and crewed by US mariners (Kruse and Hutson 2010; McCarville 2003). As a result, the service and reliability of start-ups who are dependent on one or a few vessels are seriously impacted when problems arise. Weigmans (2005) also cites the high start-up costs and related lack of service flexibility and accessibility as weaknesses of inland barge transport. Finally, although the NCFRP report found that port infrastructure issues were not a serious deterrent to IWCT, some river terminals may need expensive equipment upgrades to efficiently handle container service (McCarville 2003).

The failures of previous domestic attempts at IWCT, moreover, can be attributed to not only the industry-wide obstacles described above, but also specific organizational and management-related limiting factors and weaknesses. Lack of experience on the part of both shippers and operators, over-dependence on single shippers, and in the case of the Lower Mississippi River corridor a highly competitive and well-developed parallel rail network are all examples of this problem (McCarville 2003). In addition, better organization and leadership is required in order to provide accurate information to potential shippers and operators regarding costs, schedules, transit times, intermodal connections, and insurance in order to make informed decisions (Southeastern Ohio Port Authority 2008).

Regarding the development of IWCT along the Gulf Coast and the Mississippi River, in particular, the RNO Group in 2010 identified the overall weakness of container volume being less than 1.5% of all U.S. containers use the Mississippi River for inland transport, as the single largest obstacle to IWCT development. The development of a Mississippi River "Container Gateway," they claim, is crucial to capitalizing on the Panama Canal expansion and the anticipated increase in Gulf container activity.

IWCT: Lessons from Europe

Compared to the United States, Europe, and in particular the inland waterway network originating in the Netherlands and operating along the Rhine River, has a much more fully developed and robust inland waterway shipping sector. Over several decades, the E.U. has developed marine-supportive policies which have promoted investment and improved competitiveness for IWCT (Kruse and Hutson 2010; Weigmans 2005; McCarville 2003; Konings and Maras 2010). Several of these policy decisions, as well as organizational advances within the industry, can provide a valuable model for enhancing and supporting domestic IWCT development in the U.S..

Barge transport increased across Europe by 10% between 1994 and 2003 (Weigmans 2005). Of this increase, container barge traffic has been the fastest-growing sector, although container barges still only made up about 4% of barge activity by ton in 2002. The vast majority of barge activity, as in the US, consists of dry and liquid bulk transport (Weigmans 2005). Current European IWCT volume is estimated at 5 million TEU annually (Konings and Maras 2010). In the Netherlands, barge transportation is the second most important freight mode after trucks (Weigmans 2005), though elsewhere it still makes up a relatively small component of the overall freight network.

The capacity of European inland waterways has not been reached, while other modes, like rail and roads, have become increasingly congested, and developing marine transport is therefore more critical as an alternative transport mode than in the U.S. (Weigmans 2005). As a result, several policies supporting IWCT have been implemented by the European Union. For example, the Motorways of the Sea (MoS) initiative, which provides grants for new corridors, and the Marco Polo program, which funds projects that reduce road freight volumes and facilitates regional and international cooperation (Kruse and Hutson 2010). The E.U. also imposed trucking surcharges to bolster the effectiveness of marine policy by 'leveling the playing field' among modes (Kruse and Hutson 2010). Meanwhile, individual national governments have been tasked with tailoring and implementing European Union policy guidelines to fit the individual nation's unique conditions and constraints, with varying degrees of success (Weigmans 2005).

The design of Europe's inland marine transport network supports freight efficiency and intermodal connectivity.. Early IWCT start-ups demonstrated their dedication to providing reliable, timely service by sailing when under capacity and at a loss (McCarville 2003). They also developed strong relationships with ocean carriers and ground transportation providers from the outset to

complete the supply chain and provide a desirable service for shippers (McCarville 2003). More recently, a series of technical barge innovations, including new fuel and engine technologies, loading and unloading equipment, and related advances, have helped support IWCT growth and could further enhance its market share (Weigmans 2005; Perakis and Denisis 2008).

Perhaps the most significant innovation in European IWCT, which the US may wish to emulate, is the ongoing development of 'hub-and-spoke' barge transport networks, in which large intermodal ports serve as hubs for smaller 'spoke' terminals (Konings and Maras 2010; Kruse and Hutson 2010; Weigmans 2005). Konings and Maras (2010) argue that hub-and-spoke service development is the key to opening up new markets for IWCT, as it allows greater frequency with smaller volumes and vessels, when freight volumes are not large enough to cost-effectively justify point-to-point (direct) service. They also note that such a system is highly responsive to market fluctuations and can expand and contract as needed.

Hub-and-spoke services do increase the overall transit time over direct service, and can potentially be vulnerable to disruption due to the system's interconnectedness, however, Konings and Maras find that overall, such systems improve the performance of IWCT services and tend to be more cost-effective for shippers. But since inland waterway transport is best employed for less time-sensitive cargo, they add, the additional travel time should be of negligible impact. If carefully planned and implemented, Hub-and-Spoke networking in the U.S. could prove to be one important tool to making IWCT more cost-competitive with trucking (Konings and Maras 2010).

The approximate distance along the Rhine and Mississippi rivers are as follows:

Mississippi River

Southwest Pass – Memphis (740 miles)

Southwest Pass – St. Louis (1210 miles)

Rhine River

Rotterdam/Antwerp – Duisburg (140 miles)

Rotterdam/Antwerp – Manheim (500 miles)

Policy Implications and Technical Needs of U.S. IWCT Development

Several of the findings regarding IWCT development, in the US and abroad, are clear and consistent. Supportive government policies must be in place which put marine transport on even footing with trucking and/or rail transport. The vessel fleets must match market needs to achieve efficiency and provide adequate frequency. IWCT services must be reliable and cost competitive (Kruse and Hutson 2010; McCarville 2003; Weigmans 2005; Perakis and Denisis 2008).

Kruse and Hutson (2010) define the most important policy concern as the need to modify or compensate for the HMT, Title XI, and the Jones Act, possibly by providing tax credits for marine transport operators, providing direct incentives for shippers (which, they claim, is more effective than incentivizing operators) or allowing the use of Congestion Mitigation Air Quality (CMAQ) funds for marine projects which reduce surface transportation congestion. CMAQ funds have long been used for projects which substitute train travel for truck travel, and studies indicate that the public benefits of truck-barge substitutions are at least as great (McCarville 2003). The ports of Houston and New York have already successfully accessed these funds through SAFETEA for specific projects (McCarville 2003).

Kruse and Hutson also stress the need to eliminate current subsidies for the trucking industry and to make marine highway programs more 'trucker-friendly.' They go on to suggest the use of the EU's Marco Polo program as a model for encouraging multimodalism on a national scale. McCarville adds that existing programs which could be beneficial, include MARAD's Ship Operations Cooperative or Cargo Handling Cooperative Program, if they were better used, and better funded, to serve inland waterway freight development.

Such incentives and policy actions, particularly if concentrated on a few key corridors with the greatest industry potential, would help to reduce the 'chicken-and-egg' dilemma which has thwarted efforts to implement IWCT to date. These policies, would also help improve the public perception of this transport mode, which has been damaged by public investment in failed operations (Kruse and Hutson 2010; McCarville 2003; Weigmans 2005). Examples of domestic successes do exist. On the Columbia/Snake River waterway, a small but successful modified hub-and-spoke IWCT network is operational. This network was developed to provide container transfers from Asian ocean vessels to barges in Portland, then distributing boxes to various inland ports for export cargoes, primarily agricultural commodities (Kruse and Hutson 2010). The Columbia/Snake River IWCT network handled 50,000 containers in 2000, up from a starting point of 125 containers in 1975 (McCarville

2003). Current volumes are significantly less than the peak in 2000 primarily due to ocean carriers cancelling the Port of Portland as a call on their voyage rotation.

In addition to supportive federal policy, solutions to technical problems associated with IWCT must be addressed. Intermodal connections which allow seamless door-to-door service must be improved (Perakis and Denisis 2008). Hub-and-Spoke networks should be explored and refined to improve efficiency (Kerakis and Denisis 2008;). New, innovative vessels and barges, such as smaller vessels and articulated tugs and barges, rather than integrated tows, which match market needs and allow more efficient loading and unloading must be constructed, preferably in large quantities, so as to reduce their cost in light of the impact of the Jones Act (Kruse and Hutson 2010; RNO Group 2010).

Given the sparse literature available on IWCT development, particularly in the U.S., more research, and stronger industry and political leadership, are needed in order to holistically understand how to successfully implement new services and networks (Kruse and Hutson 2010). Several failed attempts at generating IWCT activity in the U.S. have left shippers and operators uninterested in its potential economic and environmental advantages. Research quantifying those benefits, and policies which respond to the need to improve air quality and reduce fuel consumption by incentivizing marine freight development, are needed if successful domestic inland waterway container transport is to serve a greater role in U.S. freight movement.

B. European Inland Waterway Container Service

Europe has over 30,000 km of canals and rivers forming a network that links key industrial areas and population centers. The main international waterway systems in Western and South-Eastern Europe consist of the Rhine and Danube rivers, with tributaries and canals connecting to the smaller towns and industrial centers in this part of Europe. The core network connects the Netherlands, Belgium, Luxembourg, France, Germany, and Austria through numerous inland ports and landing stages providing access to other modes of transport. The inland ports provide for regional transshipment that is tri-modal in nature, providing access to road, rail and water. International traffic is dominant at the larger inland ports due to structural agreements and collaboration with the gateway seaports. Some of the inland ports have increasingly grown to a point where they are serving as back up and feeder points for the major seaports, and acting as decongestion hubs. This is

more predominant at inland ports capable of serving short sea shipping vessels such as Duisburg. The Rhine River corridor is by far the most dominant market for inland river container transport in Europe, with over 2 million TEUs being transported in 2008. For the purpose of this section, the Rhine river delta will be profiled as the European waterway system most like the Mississippi River system.

Figure 3 **Inland river container transport flows in Europe**

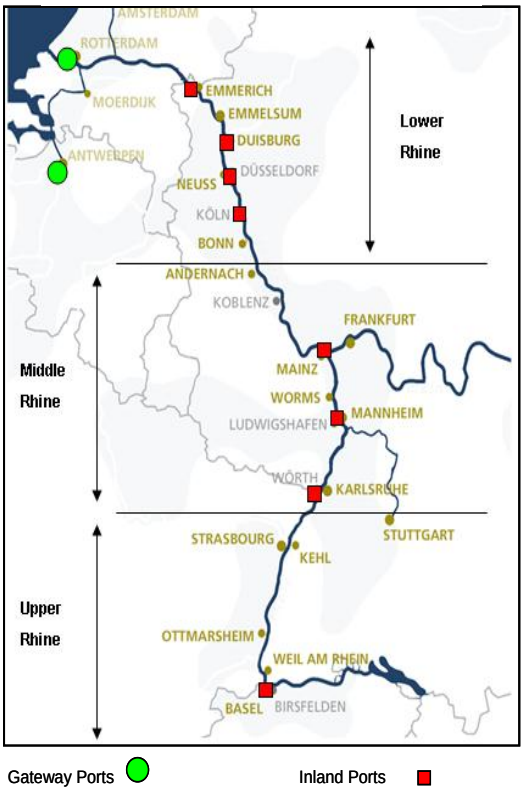
* data not available EVP = Equivalent Vingt Pieds (French: Twenty Foot Equivalent Unit -TEU)
Source: Central Commission for the Navigation of the Rhine (CCNR)

The Rhine Delta

The largest inland ports with the most container traffic can be found on the Rhine Delta. This area of the continent serves as Europe's largest industrial base. The Rhine Delta system has been largely influenced by the development and growth of the container gateway seaports of Antwerp and Rotterdam. (See Figure 3) Today, these two gateway ports at the mouth of the Rhine River provide the needed critical mass that allow for sustainable inland waterway transport in Western Europe. They account for approximately 95% of IWCT traffic moving within the Rhine Delta river system. Another influential factor, in addition to the combined container throughput at the ports, is the access to the industrial and consumption markets located along the Rhine river system. In general, the geography of Western Europe is ideally suited for IWCT due to its population densities located in

close proximity to its navigable waterways. As mentioned earlier, the location of the gateway ports along the North Sea and the access to a large industrial base contribute to the sustainability of IWCT on the Rhine River system.

Figure 4 : **Rhine Delta Trade Sections**



Source: National Ports and Waterways Institute / UNOTI

The Rhine Delta Market can be broken down into three major trades:

- **Rhine River Trade.** Barge Container movements between the ports of Antwerp / Rotterdam and the industrial and consumption areas in Germany, France and Switzerland.
- **Rotterdam – Antwerp International Trade.** Waterborne Barge Container movements between the Ports of Rotterdam and Antwerp. This traffic is the result of ocean carriers' primary port strategy of calling on one port and feedering containers to the other inland ports by barge.
- **Domestic trade.** Local barge container movements between Rotterdam / Antwerp and inland destinations in the Netherlands.

The inland port terminals along the Rhine are key components to the sustainability of IWCT within the Rhine River system. These inland ports are divided into three navigational stretches: Lower, Middle, and Upper (See Figure 4). The average turnaround times for vessels within each section to the gateway ports are: Lower – two round-trips per week: Middle – one round-trip per week: Upper – one roundtrip per two weeks.

The largest inland container handling ports are located within the Lower Rhine section. They are Duisburg and Neuss-Dusseldorf. The Port of Duisburg is located at the confluence of the Rhine

and Ruhr rivers in the industrial heartland of the Nordrhein Westphalen. According to the Journal of Commerce, Duisburg is considered the world's busiest inland port. It handled 2.25 million TEU delivered through inland waterway vessel, trucks and freight rail in 2010. The port has developed as an international logistics hub for freight of all kinds, which can be distributed by rail, road and water. Roughly 30 million people live and work within a 150 kilometer radius of Duisburg. The waterway and rail shuttle services primarily serve Antwerp, Zeebrugge, and Rotterdam.

Following Duisburg in terms of throughput along the lower Rhine section is the Port of Neuss-Dusseldorf, with a total container throughput in 2009 of 566,000 TEU. The Port of Rotterdam and the Port of Neuss-Dusseldorf are connected with 13 inland barge services per week, as well as 4 services per week by rail and it is expected to increase throughput in the next 15 years to 1.6 million TEU, according the Port of Rotterdam.

Located within the middle Rhine section is the Port of Mannheim, which primarily services the Rhine-Neckar industrial and technology center, an economic region with a population of 24 million people. The port complex is host to the largest BASF chemical plant worldwide which employs over 37,000. In 2009, according to the European Federation of Inland Ports, the port handled 95,132 TEU.

The Upper section of the Rhine handles the least amount of containers through the inland ports of Strasbourg in France which handled 74,845 TEU in 2008 and Basel in Switzerland which handled 92,464 TEU in 2008.

Historical Growth in European IWCT (1975 – Present)

Inland waterway transport of containers has developed over the last twenty years in northwest Europe as a successful mode of inland transportation. Over the past decade European IWCT has grown annually by 10% to 15% (Konings 2006). The development and historical growth pattern of European IWCT network has been described in four phases over the last 25 years. According to Theo Notteboom (2007) at the Institute of Transport and Maritime Management Antwerp, the four phases of container barge transport can be characterized as follows:

First Phase (Mid -1968 until Early 1970s): IWCT volume on the Rhine did not exceed 10,000 TEU until 1975

- Small containerized volumes were carried at irregular intervals by conventional barges from Rotterdam to transshipment points on the upper and middle Rhine. The first inland terminal was designed in Mannheim (middle Rhine) followed by terminals at Strasbourg and Basel (upper Rhine)
- Services grouped empty containers in the immediate area of the users, and original service did not include transshipment, and pre-hauls and end-hauls by truck.

Second Phase (mid 1970s till mid 1980s): IWTC Volume Growth from mid 70s to mid 80s (10,000 – 210,000 TEU)

- Growth in maritime container transport led to a limited number of port calls resulting in a high concentration of container volumes at a limited number of seaports.
- A critical mass of containers at the ports allowed for more scheduled container services by barge to gradually develop.
- Competitiveness was gained through a guarantee of fixed departure schedules for each navigation area (except during periods of low water levels)
- New terminal development occurred along the middle and upper Rhine areas to keep pace with rising volumes. (i.e. no less than 20 new Rhine terminals were opened in the period between 1970 - 1980)

Third Phase (mid 1980s till mid 1990s): IWTC Volume Growth from mid 80s to mid 90s (210,000 – 743,000 TEU)

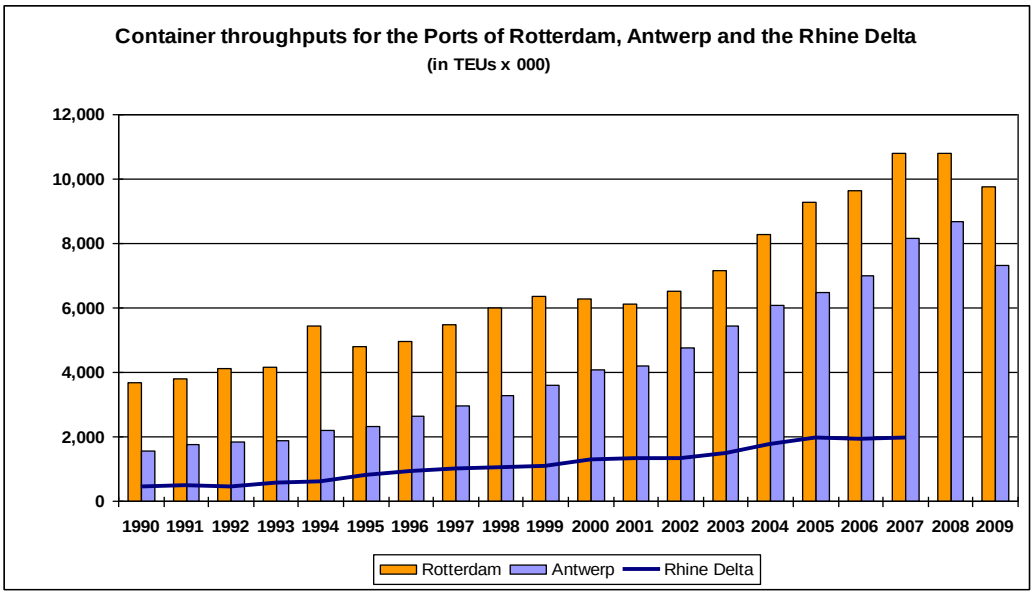
- Terminal development occurred along the Lower Rhine as a result of large scale growth at the seaports. In Antwerp, containerized barge traffic increased from 128,700 TEU in 1985 to 675,000 TEU in1995, and in Rotterdam from 225,000 TEU in 1985 to 1.15 million TEU in 1995.
- Existing barge carriers began operating joint liner services on the different navigation areas, supported by operation collaboration agreements between them. Sailing schedules were streamlined to offer high frequency service from the seaports to the Lower Rhine.

Fourth Phase (Since mid-1990s): IWTC Volume Growth from mid 90s to present 743,000 – 1,969,000 TEU

- Transport by barge begins to grow beyond the Rhine basin.
- In reaction to the potential opportunities of containerized barge transport, new terminal investment occurred in northern France, the Netherlands, and Belgium.
- Shuttle services between the Ports of Antwerp and Rotterdam emerged.
- Growth is partly initiated by financial incentives given by local, regional and national authorities.

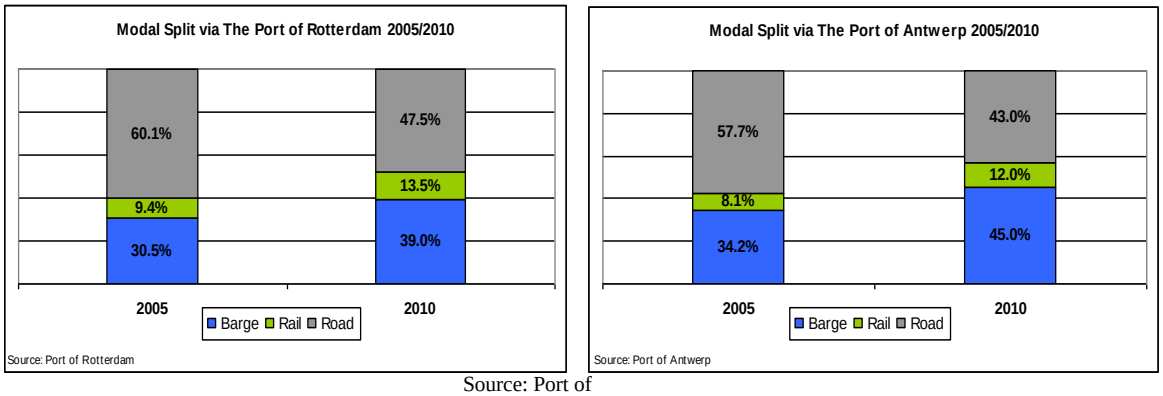
It is clear that the growth pattern over these four phases demonstrates that as volumes of containers at the gateway ports increases so does the volumes along the Rhine Delta. (Figure 5) The development of the inland river container services in Europe can also be attributed to service operators' response to the market demand by providing bundled and scheduled services, as well as terminal investments at inland ports. The modal split of containers at the Ports of Rotterdam and Antwerp has shown a slight shift from trucks to barge over the last five years.

Figure 5 TEU throughputs via Rotterdam, Antwerp and the Rhine Delta



Source: Antwerp Port Authority, Port of Rotterdam Authority, Central Commission for Navigation on the Rhine

Figure 6 **Modal Split at the Ports of Rotterdam and Antwerp**



Source: Port of

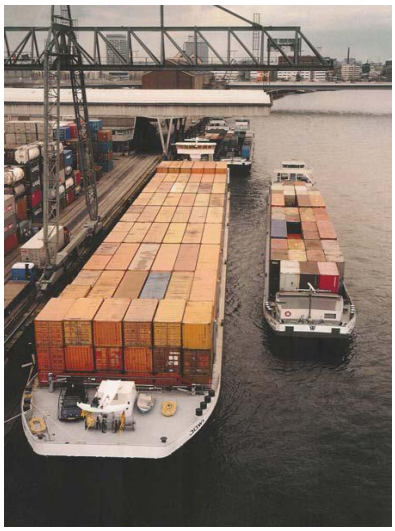
Operating Profile

The Rhine waterways are much narrower than the Mississippi River and flow rates are faster, thus limiting the size of barge formations and the number of containers that can be carried per trip. Vessels servicing the Rhine River have adopted over the years away from the traditional push barge formations, typical in the U.S., to self-propelled vessels capable of carrying upwards of 400 TEUs. In the 1970s, the average carrying capacity per trip ranged from 24 to 54 TEUs and vessels could only load two layers high due to visual restrictions from the wheelhouse. The development of the telescopic cockpit allowed for new vessel designs capable of stacking containers three layers high and by the early 1990s the average capacity was 200 TEUs. This trend of increased capacity has led to the emergence of larger vessels as in the JOWI class launched in 1998, with a carrying capacity of 400 TEU in four tiers or 470 TEUs in five tiers, water depth permitting.

Figure 8 Conventional Inland Container Vessel

Source : RhineContainer

Figure 7"Jowi" Class Next to a Conventional Inland Container Vessel



Source : Manual of Danube Navigation, via Donau, 2005

Current Policy Initiatives

Realizing the need to balance freight transport between water, rail and road systems, to improve air quality and reduce roadway congestion, the EU has established a number of policies and programs that incentivize certain decisions in the transport sector. These have included the following:

Marco Polo Program

The European Union's Marco Polo program was launched in 2003, with the goal of reducing roadway congestion and vehicular emissions by encouraging and supporting projects which promote the efficient and profitable use of rail, marine, and inland waterway freight transport. The program was reauthorized and expanded as Marco Polo II in 2007. This second phase is currently funded through 2013. Marco Polo is jointly run by the European Commission's Directorate-General for Mobility and Transport, and the European Union's Executive Agency for Competitiveness and Innovation. The program provides grants for five categories of projects (European Commission 2011):

- Direct modal shifts from roads to rail or water (includes intermodal projects which is the main focus of the program)
- Catalytic actions which promote modal shift (i.e. technology development)
- "Motorways of the Sea" between major ports (intermodal projects which divert large volumes of freight from roads to waterborne vessels; Added in 2007)
- Traffic avoidance (trip reduction through supply chain logistics; Added in 2007)
- Common learning actions (projects which promote education and awareness in intermodal transport)

Between 2003 and 2009, 125 projects involving more than 500 companies and publicly owned commercial entities have successfully utilized Marco Polo funds. The Program's 2010 budget is €64 million or US $93 million, and the application process is competitive (European Commission 2011). Criteria for award selection include: the quantity of freight shifted from roadways, anticipated environmental benefits, and the credibility and viability of the project and its operators (RNO Group 2007).

Grants cover a share of a project's capital and operating costs, and last from two to five years, at which point projects are expected to be financially self-sufficient. The maximum grant awarded to

date for a single project has been €7.5 million or US $11.9 million. Projects are required to cross an international border, and passenger transport projects, air transport projects, and pure research projects are ineligible (European Commission 2011).

Most of the projects (79%) which have been implemented as a result of this program are focused on creating direct modal shifts to rail and water—the principle focus of the program. Modal shift projects are required, at minimum, to divert an average of 60 million ton-kilometers of traffic from roadways to rail or waterways per year over the duration of the grant in order to be eligible. Modal shift projects which propose upgrading existing rail, water, or intermodal services are eligible, but must clearly demonstrate the added value of the upgrade in terms of additional modal shift generated by the project. Recipients are required to periodically report on project progress and outcomes (European Commission 2011).

In 2009, the last year for which complete data is available, 22 projects were funded. Rail projects dominated, with 41% of the total, while two projects were dedicated to inland waterway transport, and five more focused on short sea shipping, including one "Motorways of the Sea" (MoS) project. MOS-designated projects create efficient door-to-door intermodal services utilizing marine transport between major ports and rail or water-based inland distribution. This facet of the program complements the Trans-European Networks Motorways of the Sea network, which finances exclusively public-sector infrastructure in support of short-sea shipping (European Commission 2011).

Grants awarded to projects between 2007 and 2009 alone are expected to reduce road freight by 54 billion ton-kilometers, with an anticipated environmental and social benefit (cost avoidance) of €1.4 billion or US $2 billion. (European Commission 2011).

Contributing factors for the development of IWTC in Europe include the following:

Market

- The choice of international gateway container ports close to the mouth of the Rhine River Delta has created a critical mass of containers requiring transportation by multiple modes.
- With greater volumes of containers at the gateway seaports, the use of inland waterway services becomes more advantageous. (Notteboom, 2002)

- The more distant the markets from the port the greater the opportunities to exploit waterway transport (Fremont, Franc, and Slack 2009)

Infrastructure

- Weak highway and rail infrastructure necessitated intermodal service through waterways.
- The creation of numerous inland river container terminals has expanded the reach of seaports into the European hinterland.
- An existing inland waterway network permits services to the hinterland, particularly the largest cities. The greater the network's density and interconnectivity with other basins, the greater the possibilities of serving a large hinterland (Konings, 2002)

Service

- 24-hour terminal operations create greater options for shippers.
- Inland waterway services need to be reliable and frequent and offer a transit time which is competitive to road and rail. There must be network of inland waterway terminals or hubs, where traffic flows are concentrated and cargoes can be broken out and routed to their final destinations (Konings 2006)
- Location with respect to markets is essential.
- The shipper needs an integrated end-to-end service between the maritime terminal and the final destination (Panayides et al. 2002)
- No weight limitations for IWCT cargo offer a natural inducement for specific cargoes.
- Unimposed rate structures – On other modes of transport, official freight rates are imposed by external forces. These can often be higher than the market will bear which causes customers to shift modes.
- Combined waterway-road transport must be more competitive than road transport, both with regard to the price of door-to-door services and the quality of the service. (Vellenga et all. 1999)
- Inland Container Depot (ICD) status – Inland Container Depots (ICDs) are dry ports equipped for handling and temporary storage of containerized cargo as well as empties. ICD status is given to the inland terminal by the ocean carrier. This allows their customers to pick up or return empty containers inland; as opposed to having to return them to the seaport. This also allows for customers to obtain empty equipment to load at

their inland location on short notice. The ICD status of an inland terminal is market driven based on the throughput volume that is generated.

- Customs Clearance is provided at inland points.

Policy

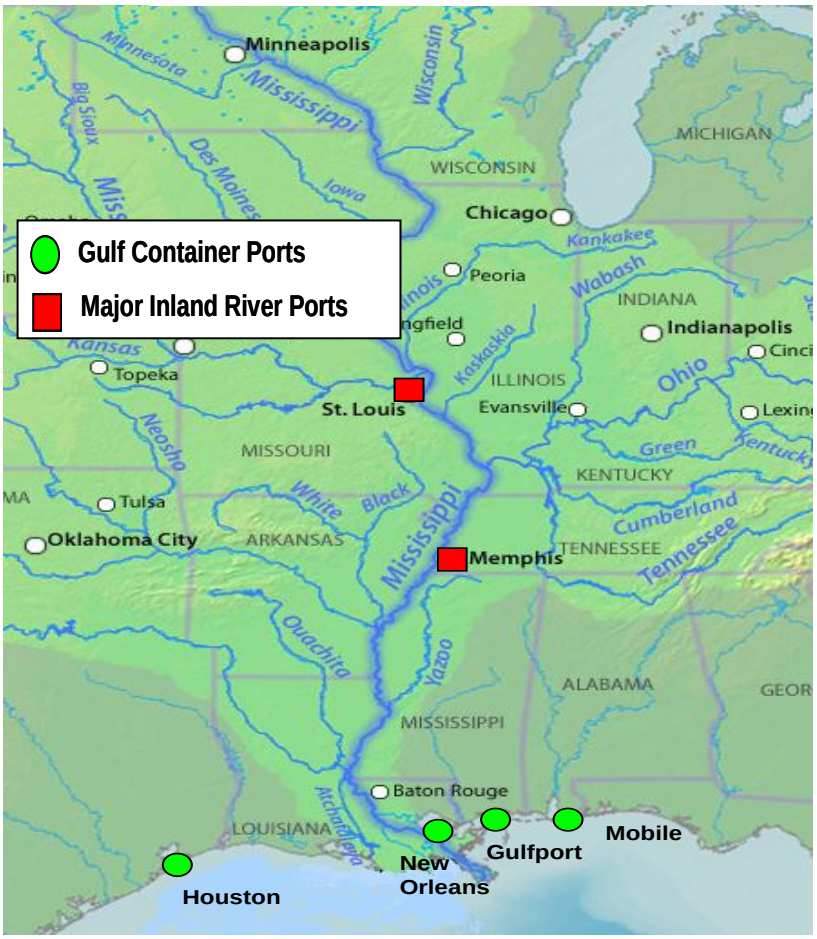
- European Union transportation policies promote inland waterway usage.
- Legislation favors intermodal transport – Distance limitations are mandated on road legs in combined transport moves (within 150 km from the terminal). The inducement: heavy containers can be carried two on a chassis within the 150 km parameter of the combined transport terminal. A direct truck movement would have to be a single container.
- "Polluter Pays" – Use of roads for long-distance transportation cause air pollution and users are taxed accordingly which has resulted in modal shifts to rail and water.

C. United States Inland Waterway Container Transport

Overall, inland waterway container transportation has remained limited in the United States, and constitutes a fairly small proportion of total waterway transport activity. Unlike in Europe, where container barge services have been successfully developing and growing in importance since the 1970s, United States inland waterway container transportation in the United States is still in its infancy. Despite decades of interest and demonstrated, but limited, federal support, very few inland container services have been created and an even smaller number have succeeded. Non-containerized bulk commodity transportation still constitutes the great majority of goods transported on U.S. waterways.

The US has nearly 12,000 miles of navigable, commercially active inland and intracoastal waterways serving 38 states, with a replacement value estimated at over $125 billion dollars. (USACOE 2000). Of this, nearly 11,000 miles of waterways are supported by the Inland Waterways Trust Fund, which is supported by fuel taxes paid by commercial waterway operators, and which funds new construction and rehabilitation of infrastructure. About 630 million tons of cargo (valued at more than $73 billion dollars) are moved through these waterways each year. Louisiana and Texas ship the greatest value of cargo per year through intracoastal and inland waterways, valued at more than $10 billion dollars per state (USACOE 2000).

Figure 9 Mississippi Valley Waterway System



Source: Adapted from Wikimedia Commons, UNOTI

United States IWCT (1975 – Present)

Since the mid 70's there have been repeated efforts in the U.S. by both the public and private sectors to demonstrate the value and validity of IWCT. To date, for a variety of reasons, this form of transport has seen limited success, although it has been tried in various forms and fashions in different geographic locales throughout the country. The following is not intended to document the extent of these services, but rather to illustrate specific examples of demonstration services that have succeeded or failed and to point out their significance to the overall conceptual framework for IWCT in the U.S. and within the Mississippi River corridor.

In March 1994, America's Marine Express, a subsidiary of Kirby Corp., began an all-water service between Memphis, TN and Mexico, Guatemala, Honduras, and El Salvador through the Mississippi River. The service utilized a chartered river-ocean vessel offering Midwest shippers a direct alternative between Memphis – Mexico – Central America on a fourteen day round trip

voyage. In August 1994, the service was discontinued as aggressive pricing from rail and truck competitors resulted in slower than anticipated acceptance of the service. Although volumes were increasing with each voyage; operating losses and negative prospects for future profitability did not warrant continuation of the services.

Beginning in 2000, the Osprey Line offered container barge service from Houston to New Orleans, and from New Orleans to Memphis. The line has focused on marketing their services for heavy and out of gauge cargos to maximize value (Kruse and Hutson 2010). The Memphis-New Orleans service relied on containerized cotton, lumber, and glucose (all southbound for export on containerships). Transit times were five days by barge, compared to 6 hours by truck. (Fritelli 2011). After Hurricane Katrina, Osprey lost significant New Orleans business, and the Memphis service was ultimately discontinued in 2009 due to a lack of northbound cargo (Kruse and Hutson 2010). Osprey attempted to establish IWCT service between Memphis and Louisville, but this was unsuccessful (Fritelli 2011). Today, the remaining Houston-New Orleans service operates on an inducement basis only (Kruse and Hutson 2010). According to Rick Couch, the operator of Osprey Line at the time, "Another hindrance to the success of the service was the port and dockage fees imposed on the water carrier but no similar charge to the truck lines. Ports should either waive dockage and port charges for IWCT or charge trucks or rail to come and go in and out of the port. Although not a deal breaker, these charges make IWCT less competitive with other modes."

Other current inland waterway operations include the 64 Express between Norfolk and Richmond, VA, using the James River, which has been operating since 2008 with conventional river barges and leveraging CMAQ funds. The service was recently awarded additional CMAQ and Marine Highway grants to expand their service, despite recent declines in container volume due to the loss of direct service to an important transatlantic container line (Fritelli 2011). However, the service has a diverse potential Richmond, VA customer base, and may be able to rebuild their market due to increasing highway congestion in the region (Fritelli 2011).

Marine Highway funds, amounting to $1.76 million, have also been allocated to the establishment of new IWCT service on the Tenn-Tom waterway between Mobile, AL, and Itawamba, MS (Fritelli 2011). TIGER funding has been set aside for Granite City, IL, and Cates Landing, TN for the construction of new Mississippi River ports, while the Port of Providence has received $10.5million to upgrade container handling infrastructure for coastal service (Fritelli 2011).

Table 2: Inland River Container Services

INLAND RIVER CONTAINER SERVICES (Past and Present)			
SERVICE PROVIDER	**SERVICE ATTRIBUTES**	**PERIOD**	**FACTORS IDENTIFIED TO DATE**
Osprey Lines	Houston - New Orleans	2000 - Present	No scheduled service at this time; on inducement basis only.
	New Orleans - Memphis	2004 - 2009	Post-Katrina, New Orleans business was lost. Lack of international northbound cargo caused service to be discontinued
64 Express www.64express.com	Twice weekly Port of Norfolk - Richmond Shallow draft vessels, push tug configuration operated by Norfolk Tug Co.	2008 - Present	Receives subsidy through CMAQ for three years. Congestion at the port of Hampton Roads is major contributor to success Carries large paper rolls as well as containers
Tidewater www.tidewater.com	Colombia River system Tows combine container and bulk cargoes. Primary container cargoes: Export agricultural products;	1932 - Present	Lack of empty containers positioned for outbound cargoes has caused container volumes to drop by 35% from 2000 to 2004. Followed by ocean carriers dropping calls at Port of Portland in 2004 and 2009 causing further drop in vol. by 32%.
Americas Marine Express (Subsidiary of Kirby)	Memphis - Santo Tomas - Purto Cortez Bi-Weekly service; exports of auto parts, white goods, fruits, vegetable. Imports of furniture, apparel, and misc. consumer goods. Utilized 256 TEU self propelled container vessels	Early 1994-August 1994	Price competition from rail lines and transit time competition from trucks forced to cease service.

Case Study: The Colombia/Snake River Service

The Columbia/Snake River provides the most significant example of a successful inland waterway container operation and the challenges faced with sustainability of IWTC in the U.S. The 465 mile corridor has served Oregon, Washington, and Idaho inland freight traffic since 1932 and container-on-barge since 1975, with Portland serving as the gateway port for all inbound and outbound cargo. The markets served are similar to the Mississippi River Valley in that the primary commodities for export are agricultural and food products. The producers of these products also are in close proximity to the inland terminals along the river system at the barge ports of Umatilla and Boardman in Oregon and Lewiston in Idaho. The startup of regular container on barge services began in 1975 and had grown from 125 TEU to 45,000 loaded TEU in 2000 until a steady decline from 2000 to 2010. According to the Pacific Northwest Waterways Association, three major factors contributed to the successful start-up: cooperation, commodity mix and geography.

Cooperation: The successful startup can be contributed to the commitment from the barge lines, shippers, and ocean carriers to making the service a success.

- The inland ports fostered early technological experiments in handling containers to and from barges as well as aggressively marketing the river system for IWCT services.
- Barge lines entered the market and began to operate upriver terminal facilities and develop specialized equipment, such as electric supply on barges to operate refrigerated equipment.
- Shippers were willing to assume some of the risk and experiment with IWCT service, and found that they could save $200-$300 per container versus trucking.
- Ocean carriers agreed to quote through rates and position empty containers at the inland ports.
- Container barges were added to existing tows of bulk grain or petroleum without any additional cost.

Commodity Mix: The commodity mix of the shippers in the area consisted of non-time sensitive cargoes such as agricultural, forest, and food products.

Geography:

- The river system feeds cargo west to the destination markets in the Far East, and Europe.
- The cargo base is confined to moving from a couple of inland locations to a major hub at the Port of Portland's Terminal 6 for transfer to ocean liner services.
- The inland move distance is 200-400 miles balancing the cost and transit times to the shippers' advantage.

According to officials at the Port of Portland, two major factors have contributed to the steady decline in barge activity since its 2000 peak: Full container loads are essential in both the head-haul and back-haul legs and the ability of the gateway port to attract and keep ocean carrier services. (Figure 8)

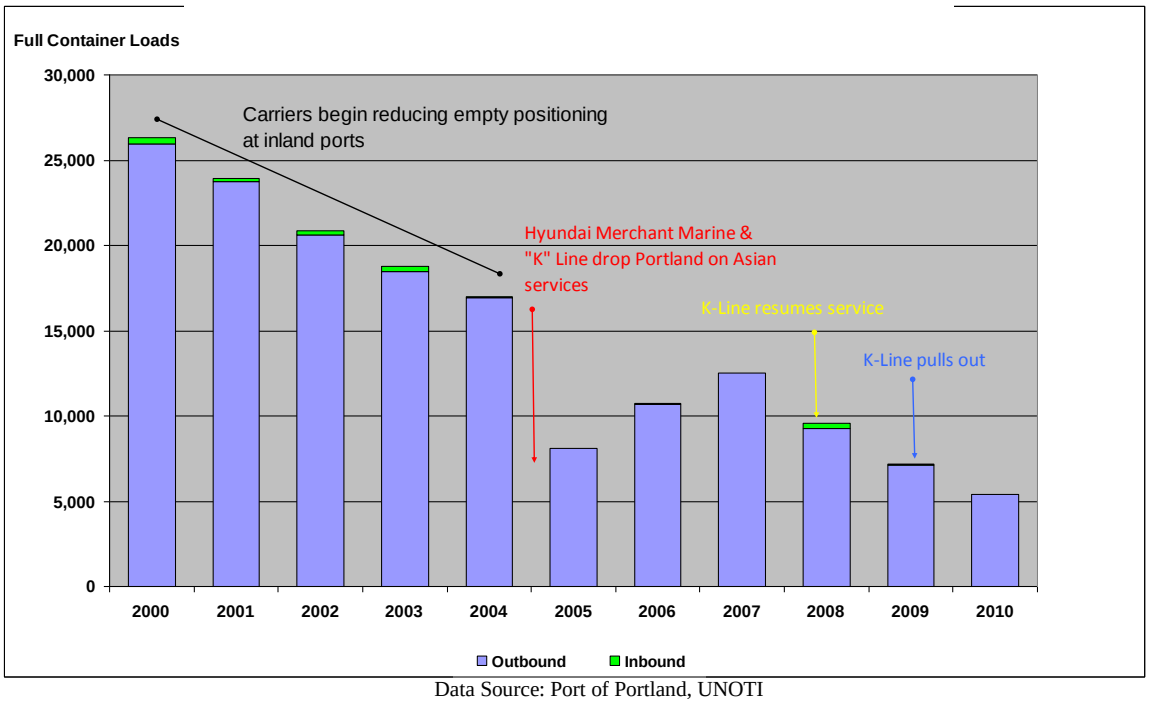
- In response to increased inbound trade from Asia in 2000, ocean liners begin reducing the amount of empty containers they were willing to position at inland ports for loading export cargoes. This forced the shippers to find alternative modes of transport to the gateway port.

*** Full container loads on the inbound and outbound leg is required to sustain ocean liner participation.**

- In 2004, Hyundai Merchant Marine and K-Line dropped the Port of Portland as a port call on their service to Japan and Southeast Asia. In 2008, K-Line resumes service after four years but pulls out after 10 months due to the 2009 economic downturn.

*** Container on barge services cannot be sustained without liner services calling at the gateway port and providing equipment.**

Figure 10 Full Container Loads on the Columbia/Snake River 2000-2010



Data Source: Port of Portland, UNOTI

Operating Context

Despite excess capacity and ample waterway width which allow large, efficient barge formations, the North-South orientation of the majority of the US inland waterway network poses a barrier to container service, as global container traffic tends to flow in an East – West direction. (ESCAP 2004). Unlike Europe, US IWCT relies mainly on traditional deck and hopper barges, with capacities ranging from about 80 TEUS (for Columbia/Snake barges) to 300 TEUs (for Mississippi River barges) rather than more advanced self-propelled vessels (ESCAP 2004). Large traditional barges may also create a disadvantage as they must be filled to capacity to be economical (Konings et al 2010).

Overall, there is an inadequate domestic supply of barges to meet demand in the U.S. This situation is further complicated by the limited shipbuilding capacity and low production volumes in the U.S. relative to Europe, which continues to inhibit domestic IWCT development (Konings et al 2010). In addition, most U.S. inland ports lack the advanced automated technology which enhances European IWCT transfer efficiency (ESCAP 2004). In some areas (excluding the Lower Mississippi), deteriorating lock conditions due to deferred maintenance creates an additional operational challenge (Konings et al 2010). Consequently, an aging fleet coupled with the lack of investment in port and waterway infrastructure limits the opportunity for expansion of IWCT services.

Current Policy Initiatives

Federal agencies, specifically, the U.S. Army Corps of Engineers and the U.S. Department of Transportation, have been involved in navigation projects since the nation's inception, and have the authority to regulate commerce and navigation and to provide navigation improvements using the Commerce Clause of the Constitution (USACOE 2000). Several recent policy initiatives have been developed through the USDOT, as well as other agencies, that will impact inland marine transportation development. These include:

- "**America's Marine Highway Program,"** part of the National Defense Authorization Act (2010): requires the Maritime Administration (MARAD) of USDOT to identify suitable candidates for Marine Highway designation, and provide grant funding for their development. Candidacy is based on the waterway's ability to 1) relieve highway or rail congestion, and 2) become financially self-supporting (Fritelli 2011). To date, 18 corridors have been identified, and $7 million in grant funding has been set aside. Along these corridors, eight Marine Highway Projects (transport services, shipyards, and ports are all eligible) have been selected for "preferential treatment" in the grant application process, as well as six secondary "Initiatives" which, though not eligible for Marine Highway Grant assistance, will receive DOT support for continued project development. The Marine Highway Corridor designation to be addressed in this Scope of Work parallels the Mississippi and Illinois rivers as well as Interstate 55, and has been identified by MARAD as M-55 (MARAD 2011a)

- **The SmartWay Program** (Environmental Protection Agency, 2004): a branding program meant to improve freight transportation efficiency, through the identification of best practices and the allocation of grants for products and service which reduce transportation-related emissions. The program recently received $20 million in additional funding through the American Recovery and Reinvestment Act (ARRA) of 2009 to enhance grant availability (Kruse and Hutson 2010; EPA 2011).

Section 3: Asian Container Trade Implications for U.S. Ports

Two major container trade lanes defined in international logistics are the Transpacific and Transatlantic lanes. The Transpacific trade lane serves the container movement between Northeast Asia and North America, which can be routed from Northeast Asia through the West Coast to inland markets of the U.S., and the all water routing to the Gulf and East Coast through the Panama Canal. The Transatlantic lane primarily services container trade between Europe and the U.S. We have focused on the Transpacific trade lane in this study due to: 1.) Northeast Asia –U.S. trade currently represents the largest trade volume: 2) The Panama Canal expansion will impact long-haul trades such as the Transpacific, where larger Panamax vessels are expected to be deployed to take advantage of the economies-of-scale. Allowing the larger vessels to pass through the canal is expected to cause a shift in current shipping patterns over time and potentially impact Gulf and East Coast volumes.

A. Mini-Landbridge versus All-Water

A mini-landbridge can be defined as, "the connection between a marine port and an inland destination by use of multiple land transportation modes such as truck and rail, without any handling of the cargo itself between modes." The North American landbridge is an outcome of the container revolution and serves as a hinterland extension from a coastal port using ISO containers for the entire ship-to-door transfer and transport process, also referred to as *intermodalism*. Container traffic represents approximately 80% of all rail intermodal moves for the longer distance land transport leg. Trucking is used for shorter distances and final delivery to the "door".

Historically, the primary West Coast ports for import and export of Asian traffic to the major consumption markets east of the Mississippi river have been the ports of Los Angeles-Long Beach (LA /LB), Oakland, Seattle-Tacoma and Portland. These ports pioneered the intermodal transportation concept, and currently the intermodal traffic at these ports account for 40 – 50% of their total traffic. Most of the intermodal traffic handled at the LA/LB is destined to the Midwest, with the rest destined to the Gulf and East Coast. Approximately 60% of the continental U.S. population resides east of the Mississippi river, and accounts for an approximate 60% share of the nation's GDP. Long distance land bridge services between the west coast gateway ports and northeast gateway ports through Chicago represents the most efficient land bridge in the World. It takes an average of 4 days to connect Los Angeles-Long Beach to Chicago and an additional 3 days from Chicago to New York.

The West Coast has dominated in the U.S. for Asian traffic due to its geographic location as the shortest sea route, fastest transit time, and its inland rail connectivity to the Mid America markets. However, with the advent of the expanded Panama Canal, there are signs indicating a downturn in future market growth. This is particularly evident at the ports of LA/LB, according to a white paper published in April 2009 "The De-Intermodalization of Southern California Ports" by Asaf Ashar of the University of New Orleans Ports and Waterways Initiative. This report suggests that intermodalism at these ports has peaked and is likely to substantially decline in the future due to new all-water services. This downward trend can be attributed to a convergence of several factors:

- **Shifting Trade Lanes**. With the sources of imports moving from China to South Asia and, perhaps Latin America ("near shoring"), the traditional transpacific route is expected to lose ground to the Suez and other direct All-Water trade lanes to the US East and Gulf coast ports.
- **Logistics Improvements**. A related improvement in the supply chain of big retailers allows them to become less dependent on the faster and more costly intermodal route. They have constructed large distribution centers (DCs) and warehouses in close proximity to the US East and Gulf coast ports in various locations.
    - **Virginia Port Authority**
        - Wal-Mart – 3 million ft^2
        - Target – 1.5 million ft^2 and expanding
        - Cost Plus – expanded to 1.1 million ft^2

    - Dollar Tree, QVC, Home Depot, Family Dollar

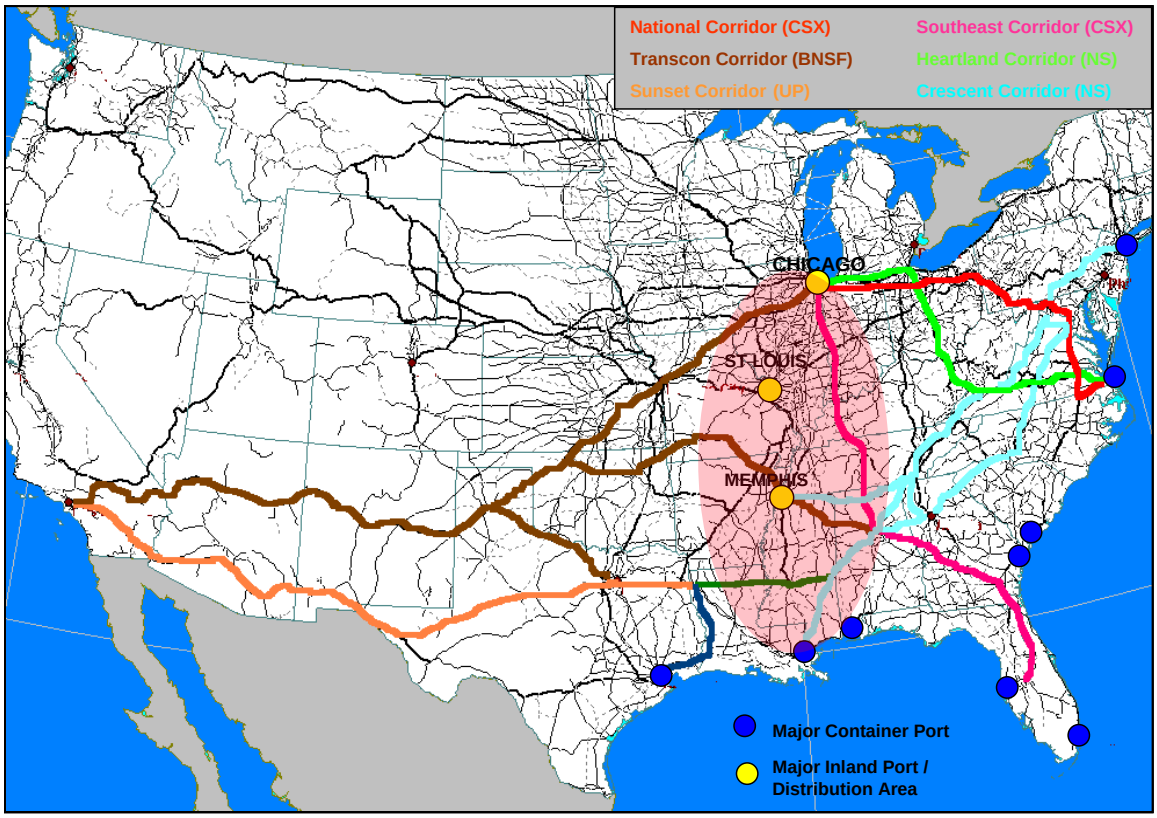
- **Jacksonville and Orlando have experienced significant growth in Distribution Centers**
- **Port of Houston – Cedar Crossing Industrial Park**
    - Home Depot – 755,000 ft^2
    - Wal-Mart – 4 million ft^2
- **Georgia Ports Authority**
    - Advanced Auto Parts
    - Target – 2.1 million ft^2
    - IKEA – 1.7 million ft^2
    - Home Depot – 1.4 million ft^2
    - Wal-Mart (Savannah-Statesboro) – 3.3 million ft^2
    - Bass Pro Shops, Best Buy, Pirelli Tires, Fed Ex, Lowes
    - 200 DCs within a 5 hour drive of Savannah
- **Port of New York-New Jersey Portfields Initiative**
    - $1.8 million to identify 20 sites for DC development
    - Cooperation with developers to market and develop the sites with focus on "near port" locations

- **Rising Fuel Cost**. Higher fuel costs favor water transport over the much higher fuel-consuming land transport modes, (truck, rail) resulting in widening the cost differentials between the All-Water route, either through Panama or Suez, and the intermodal route.
- **Expansion of the Panama Canal**. The new Panama Canal locks will allow the All Water route to deploy new Panamax (NPX) ships of similar size and transport cost to those deployed on the transpacific leg of the intermodal route, resulting again in widening the cost differentials between the All-Water and the intermodal route.
- **Dwindling Ship Size Economies**. Although there are a few containerships larger than the NPX (e.g., Maersk E-class), the savings in capital and operating costs of ships beyond the NPX size (which this author believes may eventually reach close to 15,000 TEUs) are relatively small. Hence, future deployment of post-NPX vessels on the transpacific will not affect much its relative cost vs. the All-Water route through the Panama Canal. Likewise, post-Panamax vessels can be deployed on the Suez route.
- **Development of Transloading**. The near-port transfer of cargo from 40-ft marine containers to 53-ft domestic containers has been gaining popularity in recent years. The

larger domestic container have 50% more capacity, do not have to be returned to foreign destinations and also allows for consolidation of same destination freight during the transloading process. While transloading may substantially save on transport cost, it requires more time and further dilutes the "express effect" of the intermodal route through LA/LB.

- **Rising Port Costs**. The LA/LB region suffers from severe problems of air pollution and traffic congestion, with the area's ports considered a principal source. To mitigate these affects, various laws or operating standards have been created to assess costs associated with both air quality and roadway congestion including,: increased harbor fees, cold ironing, "slow steaming", clean fuel standards for ships, "cleaner" harbor truck emission standards, electrified handling equipment and the unionization of harbor trucking.
- **Shortage in Waterfront Lands**. The LA/LB area has a severe shortage of developable waterfront land; development of the few still available sites face stiff environmental resistance. This shortage may force the Port Authority to pursue expensive technologies for storage densification which may increase costs and may result in slower operation.
- **Emergence of Alternative Intermodal Gateways**. By recent estimates, at least 15 present and future ports, on the Pacific, Gulf and Atlantic Coasts of the US, the Pacific and Atlantic Coasts of Canada and the Pacific Coast of Mexico, are vying to serve the US hinterland through intermodal means.
    - **Class-1 Railroads investing in intermodal corridors**
        - Norfolk Southern launched the Heartland Corridor Project in 2010 providing double-stack service between Hampton Roads, VA and Chicago, IL through Columbus, OH.
        - CSX launched its National Corridor project scheduled to be completed in 2015 providing double-stack connection between the ports of Baltimore, Norfolk-Hampton Roads VA and Wilmington NC and Mid America.
        - Southeast Corridor (CSX): $250 million
        - Transcon Corridor (BNSF): $2 billion
        - Crescent Corridor (NS): $2 billion
        - Prince Rupert, British Colombia: $170 million
        - Lazaro Cardenas, Mexico

Figure 11 Major Corridors and Container Ports in the United States Reaching Mid-America



Source: University of New Orleans Transportation Institute, UNOTI

B. Panama Canal Expansion Implications for East and Gulf Coast Ports

The expansion of the Panama Canal, which is due to be completed in late 2014, will have an impact on trade routes, port development, cargo distribution and the US shipping sector in general. The canal expansion will enable much larger Post-Panamax vessels to transit, causing transformations in the container trade. There is an overall agreement that container traffic will increase in the Gulf and the East Coast, but the real challenge is predicting the extent and location of these impacts. The following is a list of activities that have occurred in the Atlantic and Gulf port regions in the last five years.

- **Shifting trade patterns favor All-Water services in response to:**
    - West Coast ports labor/management issues
    - Intermodal rate increases
    - High West Coast port costs

- **Growth in Distribution Center Activity at East and Gulf Coast ports**
- **Competition between East and Gulf Ports based on:**
    - **Terminal Development**
        - Channel depth to 50 ft. to accommodate 8,000 TEU vessels is being pursued by various ports throughout the U.S. Only three ports currently have 50ft draft – Norfolk, New York, Baltimore
        - Berth capacity to handle 1,000 ft. plus vessels
        - Storage and crane outreach capability
        - Capital investment requirements
    - **Local Market**
        - Ports of New York-New Jersey serves largest consumer market
        - Savannah serves the Atlanta and Florida market
        - Midwestern market is open for competition from Atlantic and Gulf ports
        - One third of Texas market is served through the Ports of LA/LB

C. Implications for Inland River Container Transport

If market observations are correct and the Midwestern markets are open for competition, conventional wisdom points to the potential for inland waterways to be used for container transport. This mode of transport has not been fully utilized based on a multitude of factors, but the market will reward the "path of lowest cost" for large amounts of cargo. These questions remain: 1) What critical mass of containers will be necessary to drive this mode of transport as a competitive alternative to rail or road transport? 2) Will the Panama Canal expansion bring the required growth in Asian market share to a gateway port in the Gulf?

Section 4. External Factors Affecting IWCT's Future

The external market forces affecting freight transport, which appear to provide additional advantages to IWCT, can be divided into two main categories:

- Operating costs- including the maintenance of the physical condition of highways, railway infrastructure, waterway infrastructure, fuel, time and fees

- Social costs- including congestion, safety, pollution, and noise according to Hanson Professional Services Inc. 2007.

These public costs which impact freight modal choice are outlined below.

A. Operating Costs

Infrastructure Maintenance Costs

According to the Highway Cost Allocation Study (HCAS) conducted in 1997, the marginal pavement maintenance cost to transport an 80,000 pound, five-axle combination vehicle truck one mile is 12.7 cents on rural highways, and 40.9 cents for urban highways in 1997 dollars (Hanson Professional Services Inc. 2007). The marginal costs of highway transport, in terms of road and pavement maintenance, are directly proportional to the tonnage transported. More weight results in greater damage.

Conversely, the marginal costs of marine transportation are *not* directly proportional to tonnage. That is, the costs of waterway maintenance, including channel maintenance and dredging, lock staffing, lock maintenance, are relatively fixed by the waterway's capacity and the age and maintenance history of its infrastructure. If existing marine traffic were to convert to highway traffic, the increase in marginal maintenance costs would become clear. On the other hand, if a greater portion of road haul freight switched to marine transport on waterways with excess capacity, overall and marginal maintenance costs would decrease, potentially saving millions of tax dollars now used for highway repair (Hanson Professional Services 2007).

The 2007 Alabama Freight Mobility Study (Hanson Professional Services 2007) found that the average yearly operating and maintenance cost associated with the average 22 million tons of cargo moved on the Black Warrior-Tombigbee Waterway (BWT) from 1999-2004 was $17.5 million. The highway deterioration cost to move this amount of tonnage by truck would be $24.39 million. The U.S. Corps of Engineers estimated the capacity of the BWT to be from 45 and 55 million tons annually. Using 45 million as the maximum capacity tonnage for the BWT, the associated highway pavement deterioration costs if moved by truck are estimated to be $49.97 million, while the waterway maintenance cost would remain constant at $17.5 million.

The authors caution, however, that this finding does not include the relative social costs of inland marine and highway transport, which have not been adequately researched for inland waterway transport.

Fuel Costs

Perhaps the most compelling market factor to affect the development of IWCT and other marine services is the impact of rising or volatile fuel costs. Both rail and water transport modes are far less sensitive to fuel price increases than truck transport per container-mile. Marine transport, and Container-on-barge (COB) in particular, is the most fuel-efficient mode available (Table 3). Container-on-barge can transport one ton of freight 514 miles using one gallon of fuel (TEMS 2008). The cost savings of water versus truck transport becomes disproportionately greater with increased fuel costs, even after accounting for concurrent increases in drayage costs (movement from ports and rail terminals to final destinations by truck) (TEMS 2008). As a percentage of total line-haul costs, COB fuel costs make up 18% of the total,
compared to 35% for rail and 46% for trucking services (TEMS 2008).

Table 3: Comparison of Fuel Prices and Line Haul Costs by Mode (in 2008 dollars)

	Fuel Price (US Dollar)		**Cost Per Container (FEU) Mile**	
Scenario	Crude Oil per Barrel	Diesel per Gallon	Truck	COB
2002 Historical Data	28.85	1.37	1.41	0.19
2005 Base Level	54.79	2.4	1.75	0.21
2020 Low-Estimate Scenario	59.61	2.61	1.82	0.21
2020 High-Estimate Scenario	157.18	6.88	3.24	0.28

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

Between 2000 and 2008, when oil prices reached a historic high, the cost of transporting one TEU container from China to Ohio increased by 265%. Overall transport prices rose by 100% (TEMS 2008). The Maritime Administration of the U.S. DOT estimates that by 2020, oil costs will range from a low-end estimate of $60-80 per barrel, to a high-end estimate of up to $160 per barrel. Even their lowest estimate is three times the 1990s average equilibrium price of approximately $20 per barrel, and will have a significant impact on U.S. freight movement, “creating a transportation environment more like that of Europe in the 1990s,” where marine transport has experienced substantial growth (TEMS 2008, p. 51). Moreover, increases in fuel costs in the near future are

likely to be the result of increasing worldwide demand—a trend which is unlikely to abate—rather than interruptions in supply, indicating that prices are less and less likely to rebound to previous (lower) levels (TEMS 2008).

Transport Economics and Management Systems, Inc. (2008) estimates that if fuel prices do continue to rise, domestic waterborne container traffic is likely to increase by 200-300%, due to the direct cost advantage, as well as the rail terminal congestion issues previously noted. However, COB is still likely to serve primarily lower-value container freight, due to its slower shipping times and the tendency to reduce vessel speeds to maximize fuel efficiency and minimize operating costs.

Time Costs: Congestion and Debottlenecking

As previously noted, rail terminals have become increasingly congested, and many rail corridors are operating at the limits of their capacity, while highway corridors continue to experience congestion as well. This results in bottlenecking at intermodal terminals and interchanges, and often significant delays—sometimes weeks—in overall transit time. U.S. inland waterways are typically operating significantly under capacity, and thus do not experience congestion delays except at specific locks located on the upper Mississippi river. This also makes delivery times more reliable for shippers. These factors increase the relative cost of rail and truck transport, and make alternative water-based services increasingly more attractive (TEMS 2008; Hanson Professional Services 2007).

B. Policy, Economic and Resiliency Factors

Environmental Policy

Environmental concerns associated with freight transport include air pollution (e.g. sulfur oxides, carbon oxides, oxides of nitrogen) and, to a lesser extent, noise pollution. Federal environmental policy impacts the relative costs associated with negative environmental outcomes, and can affect shippers' modal choice.

Clear differences exist among modes in the quantity of emissions produced. On a per ton and per 1000 mile basis, marine transport—and barge transport in particular, shows a clear environmental advantage over rail or truck transportation. (Table 4)

Table 4: Emissions by Transportation Mode (Pollutants in lbs produced per ton of cargo per 1000 miles)

Mode	Hydrocarbons	Carbon monoxide	Nitrogen dioxide
Tow boat	.09	.20	.53
Train	.46	.64	1.83
Truck	.63	1.90	10.17

Source: Hanson Professional Services, Inc (2007).

Key federal environmental policies impact freight modal choice. These include the Clean Air Act Amendments of 1990, which require reductions in the amount of emissions from vehicles and impose additional control measures in National Ambient Air Quality Standards (NAAQS) nonattainment areas, while creating a much stronger link between transportation and air quality control. This initial correlation was reinforced by the passage of the multiyear federal transportation bill ISTEA in 1991, which developed a policy focus on multimodalism and authorized the Congestion Mitigation and Air Quality Improvement program (CMAQ), later reauthorized under TEA-21 in 1998 and SAFETEA-LU in 2005.

CMAQ was originally conceived to fund surface transportation projects which relieve congestion and help improve air quality. Since its 2005 reauthorization, CMAQ has disbursed nearly $9 billion to state Departments of Transportation and Metropolitan Planning Organizations for various transportation projects, congestion mitigation strategies, and emissions reduction efforts (FHA 2011). Funds are disbursed based on state populations, as well as on the degree of air pollution which must be addressed: states with lower air quality are eligible for more CMAQ funds.

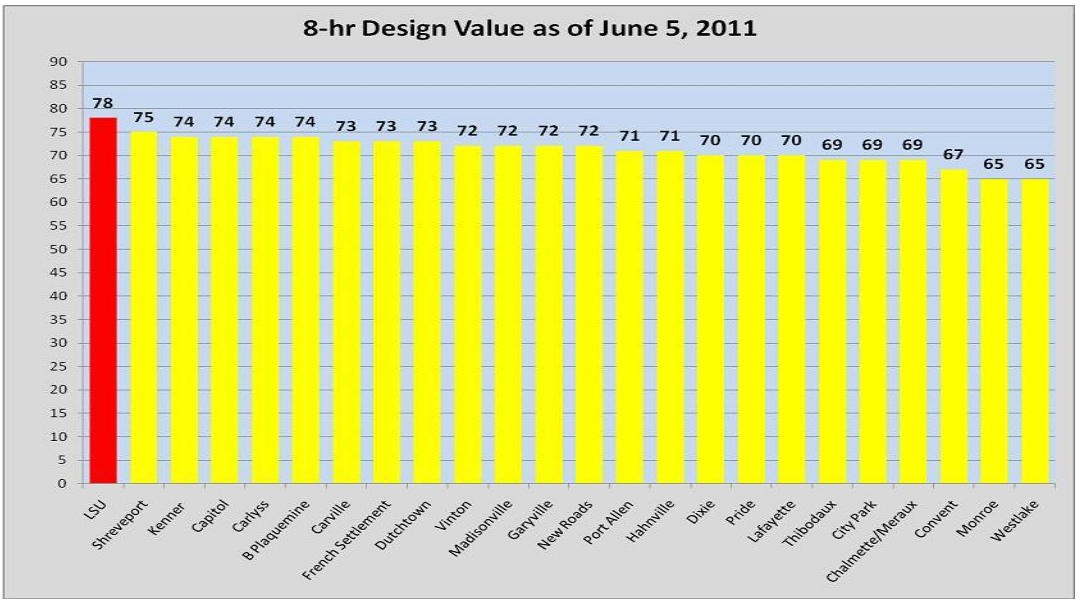
Despite significant gains in air quality and emission reduction overall, air pollution from volatile organic compounds (VOCs) and fine particulate matter released by combustion engines remains a significant problem. The EPA estimates that approximately 62 million people were living in air quality standard nonattainment areas in 1999 (FHA 2011). Of note, vehicle exhaust from both cars and trucks is one of the most significant contributors to pollution levels, especially in congested metropolitan areas.

According to the Federal Highway Administration, "the most effective CMAQ-funded projects tend to be large in scope and those that directly affect vehicle emissions" (FHA 2011). Projects which directly remove cars from the road such as public transit, bike and pedestrian infrastructure are emphasized in that report. However, a variety of project types such as education campaigns, technology improvements to enhance system efficiency, inspection programs are eligible for CMAQ funding, so long as they can be proven to directly improve air quality in a nonattainment or maintenance area. Highway maintenance, reconstruction, and expansion projects are ineligible, even if they are intended to relieve congestion. CMAQ funds can be used to fund private enterprises, under certain circumstances and in partnership with a public agency.

To date, the use of CMAQ funding in marine projects has been limited and largely experimental: $1.9 million was allocated to the Red Hook Container Barge in New York to purchase a vessel for Hudson River freight movement, removing 54,000 truck trips annually (FHA 2011). At the Port of Norfolk, VA, $2.3 million in CMAQ funds were used to expand COB service to Richmond, relieving interstate congestion in the corridor (Frittelli 2011). However, given the clear environmental advantages of marine transportation in terms of emissions per ton-mile, this program's potential for assisting in the development of inland waterway services, including COB, should be investigated further.

Of significance to the New Orleans region is the anticipated EPA designation of the area as nonattainment. The EPA is proposing to revise the 8 hour ozone standard from 0.075 parts per million (ppm) set in 2008, to a level within the range of 0.060 – 0.070 ppm. Currently the design values for the monitors at Kenner, Madisonville, Garyville, Hahnville, City Park and Chalmette-Meraux range from 74 ppm to 69 ppm. (See Table 5) The EPA schedule for making final area designations is currently set for the end of July, 2011. Moving these areas into a nonattainment category would allow eligibility for CAMQ funding and potential applications within the marine transportation sector along the Mississippi River corridor.

Table 5: Louisiana 8-Hour Ozone standard monitor levels



Source: Louisiana Department of Environmental Quality

Cargo Volumes and Overweight Factors

Another cost advantage to marine and IWCT service is the elimination of highway weight limits for truck-based container freight. Intermodal containers are subject to weight limitations of the weight-bearing capacity between the beginning and end of the over-the-road segment. Commonly known as "bridge laws," they are based on the maximum weight that can be supported by a bridge.

Before leaving port facilities, containers are weighed to assess that they conform with the overall weight restrictions along the route from the point of origin to the final delivery point. Although in most cases the container will "cube out" (uses all the space) before it weighs out, there are certain heavy commodities such as tiles, liquids, and metals that will weigh out leaving unused weight capacity of the container. For example, although a standard 20 foot has a maximum payload capacity of 47,885 pounds, the recommended maximum ocean freight payload is 35,000 pounds to accommodate the added weight of the tractor and chassis and still comply with road weight restrictions. If this same container were to be transferred from ocean vessel to barge for final delivery, the cargo payload could have been increased by 13,000 pounds. With the ocean freight rate remaining the same this would lower the cost per ton to the shipper.

A key factor for IWCT to take advantage of unrestricted weight limits per container is the creation of overweight corridors for servicing industrial and distribution sites. (i.e. very short distance truck moves from the water to the site). Overweight corridors allow for heavy loads to move by water and then to a final staging or storage area without incurring the cost of transloading. As stated earlier, marine carriers can transport containers and general cargoes that greatly exceed the limits of over-the-road transport.

The Case of Cedar Crossing Business Park and Couch Lines

A case in which overweight infrastructure was created and overweight corridors were designated is the Cedar Crossing Barge Dock. This facility is located on Cedar Bayou across the Houston Ship Channel from the Port of Houston's Barbour's Cut and Bayport container terminals. The Cedar Port was opened in 2008 with the goal of attracting shippers of containerized and bulk goods to move between the Port of Houston complex and the Cedar Crossing Industrial Park. The industrial park is host to several major distribution centers totaling over five million square feet. The first client to utilize the overweight corridor connecting the Cedar Port facility was a local plastics manufacturer who realized the cost advantages of stuffing their containers to the maximum payload and then barging them to Barbour's Cut Container Terminal for export. Couch Lines currently provides container transfer service between Cedar Port terminal and Barbour's Cut as well as a COB shuttle service from Houston to New Orleans on an inducement basis. According to the owner, Couch Lines works directly with the ocean carriers under service agreements to move containers from one port or terminal to another such as Houston-New Orleans or Barbours Cut-Cedar Port. He said, "The ocean carrier quotes a rate on a through Bill of Lading and allows the shipper to load the container to maximum payload at a standard rate for that commodity. Couch Lines rate is built into the total ocean quote to the shipper, who then pays Couch Lines as it would a trucker or rail line. The ocean carrier prefers using the water transport mode because it allows them to get a significant amount of boxes out to one destination in one move". Another advantage of transporting containers by water versus truck is that barges can load and discharge at any time of day or night depending on berth availability, where trucks are restricted by terminal gate hours.

Freight Transportation Resilience

The United States economy is dependent upon freight transportation and its ability to deliver goods from ports to inland points of consumption. A resilient freight transportation system must have the capability to function as a whole during a disruption caused by significant damage to any part or parts of its infrastructure. A disruption is an event significant enough to necessitate the transportation system to operate in a new and altered state. The system can be potentially overwhelmed for a specific period of time in its ability to adjust to the disrupted situation, as was demonstrated in New Orleans post-Katrina. Our nation's freight transportation system is a vital component of our corporate supply chain, which has enabled significant economic growth over the past several decades but now needs to adjust to disruptions both locally and, as we've recently learned by the multiple disasters in Japan in 2011, internationally. To accomplish resiliency, the overall transportation system must be both flexible and redundant.

As a key component to business operations, the transportation system must be flexible and provide options to switch from one mode to another during any disruption or disaster. According to Morlok and Chang (2004), a flexible system is able to accommodate changes in demand or traffic flows without significant declines in performance, regardless of the cause. To measure flexibility, they define "system capacity flexibility" as the "ability of a transport system to accommodate variations of changes in traffic demand while maintaining a satisfactory level of performance (p. 406)." Morlok and Chang (2004) cite two principal motivations for their approach to the analysis: (1) traffic is increasing while transportation infrastructure and capacity are roughly constant; (2) shifting trade patterns and sourcing strategies, namely a larger number of smaller shipments, are resulting in different demands on the transport system than were originally intended. However, neither of these principals take into account the impact of localized or system-wide disruptions caused by disasters.

As mentioned earlier, the Americas Marine Highway Program identified 11 corridors, 4 connectors and 3 crossings that can serve as extensions of the surface transportation system. The corridors were identified when water transportation presents an opportunity to offer relief to landside corridors that suffer from traffic congestion, excessive air emissions or other environmental concerns and challenges. (MARAD 2011a) The total public benefits of the system can be summarized as follows: improved air quality, increased freight capacity, fuel savings, reduced highway congestion,

reduced traffic bottlenecks, improved roadway safety and security for transporting hazardous materials, reduced highway maintenance costs.

The M-55 Marine Highway Corridor, including the Mississippi-Illinois Waterway systems, parallels Interstate 55 and the CN railroad corridors, linking Illinois, Missouri and other central states with deep water ports along the Gulf of Mexico. These downriver ports offer containership liner services for the international export of containers. In addition to the public benefits outlined, the multiple transportation assets within the M-55 corridor have the ability to provide redundancy given their North-South parallel orientations and their ability to reach similar destinations. The M-55 Marine Highway Corridor has excess capacity to handle major freight diversions from rail or road if called upon. This increases the resiliency of the total transportation system. In the event of a major disruption, traffic flows could be diverted to specific ports located along parallel land routes with the intention of combining international and domestic traffic utilizing the inland waterway system. Within the study area between Tri City Port District, Granite City, IL and the mouth of the Mississippi river there are 8 rail bridge crossings. If damaged, these bridge crossings could cause widespread disruptions to freight traffic causing negative impacts across a broad range of economic sectors. As part of the total system, IWCT along the M-55 Marine Highway Corridor could provide significant redundancy to the freight transport network in the event of an incident on these bridges**.**

Table 6: Mississippi River Rail Crossings from New Orleans to St. Louis

Rail Bridge Structure	City, State	River Location	Highway	Railroad	Daily Traffic Count
Huey P. Long 1	Jefferson, LA	Lower River Mile 106.1	US-90	New Orleans Public Belt	20 Trains/ Day (Estimated)
Huey P. Long 2	Baton Rouge, LA	Lower River Mile 233.9	US-190	Kansas City Southern	6 Trains/ Day (Estimated)
Old Vicksburd	Vicksburg, MS	Lower River Mile 437.8	Closed	Kansas City Southern	12 Trains/Day (Unconfirmed)
Frisco	Memphis, TN	Lower River Mile 734.7	None	Burlington Northern Santa Fe (BNSF)	30 Trains/ Day (Unconfirmed)
Harahan	Memphis, TN	Lower River Mile 734.8	None	Union Pacific (UP)	20 Trains/ Day (Unconfirmed)
Thebes	Thebes, IL	Upper River Mile 43.7	None	UP/BNSF	35 Trains/ Day (Unconfirmed)
Gen. Douglas	St. Louis, MO	Upper River Mile 179.0	None	Terminal Railroad Association	45-30 Trains/ Day (Estimated)
MacArthur	St. Louis, MO	Upper River Mile 183.2	None	(TRRA)	25-30 Trains/ Day (Estimated)
Merchants				TRRA	

Source: www.johnweeks.com, TRRA, KCS, NOPBRR, et al)

Section 5. Regional Overview of Selected Gateway and Inland Waterway Terminals

Historically, Mississippi River terminals have developed in response to the private industries that have operated at or near its banks for the last 100 years. These industries today are primarily engaged in the movement of bulk and breakbulk products for international export and import.

Currently there is only one major container facility handling significant international traffic within the Regional Planning Commission's jurisdiction such as the Port of New Orleans Napoleon Avenue Container Terminal. Although other concept container terminals for the Lower Mississippi river have been proposed and reviewed over the years, none have been realized to date.

A high level investigation was recently conducted by UNOTI that included gateway and inland terminal sites along the Lower and Upper sections of the Mississippi River, conceptual a actual, that would contribute to the development and or expansion of Inland Waterway Container Transport. The list of sites was then compiled based on a number of factors. They were also organized into either gateway or inland port facilities. For the purposes of this study, a gateway port is characterized as one being located in close proximity to open water shipping lanes and that could handle 500,000 containers or more per year. An inland port is defined as a facility that is located in close proximity to inland distribution centers and or large consumption markets.

The factors used to determine the suitability of gateway ports were as follows:

- Direct access to the Mississippi River and terminal access for barges and or shallow draft inland container vessels
- Volume of international container imports and exports handled (current and projected)
- Proximity to international waters and shipping lanes
- Container terminal capacity development plans
- Commodity Data (current and potential)
    - origin – destination
    - types and weights

The factors included in determining the suitability of the inland ports were as follows:

- Location outside the lock system
- Intermodal connectivity to reach major consumptions markets
- Proximity within 15 miles to major highways, rail ramps and distribution facilities
- Minimum .25 acres of ground storage per TEU handled
- Available acreage for value added activities such as warehousing, stuffing and stripping facilities, container maintenance and repair.
- Amount of new infrastructure construction needed.

The ports and marine facilities included in this study were identified through a process of site visits, port official interviews and the baseline criteria outlined above. Based upon these factors, selected ports within the New Orleans region as well as upriver facilities were analyzed as potential

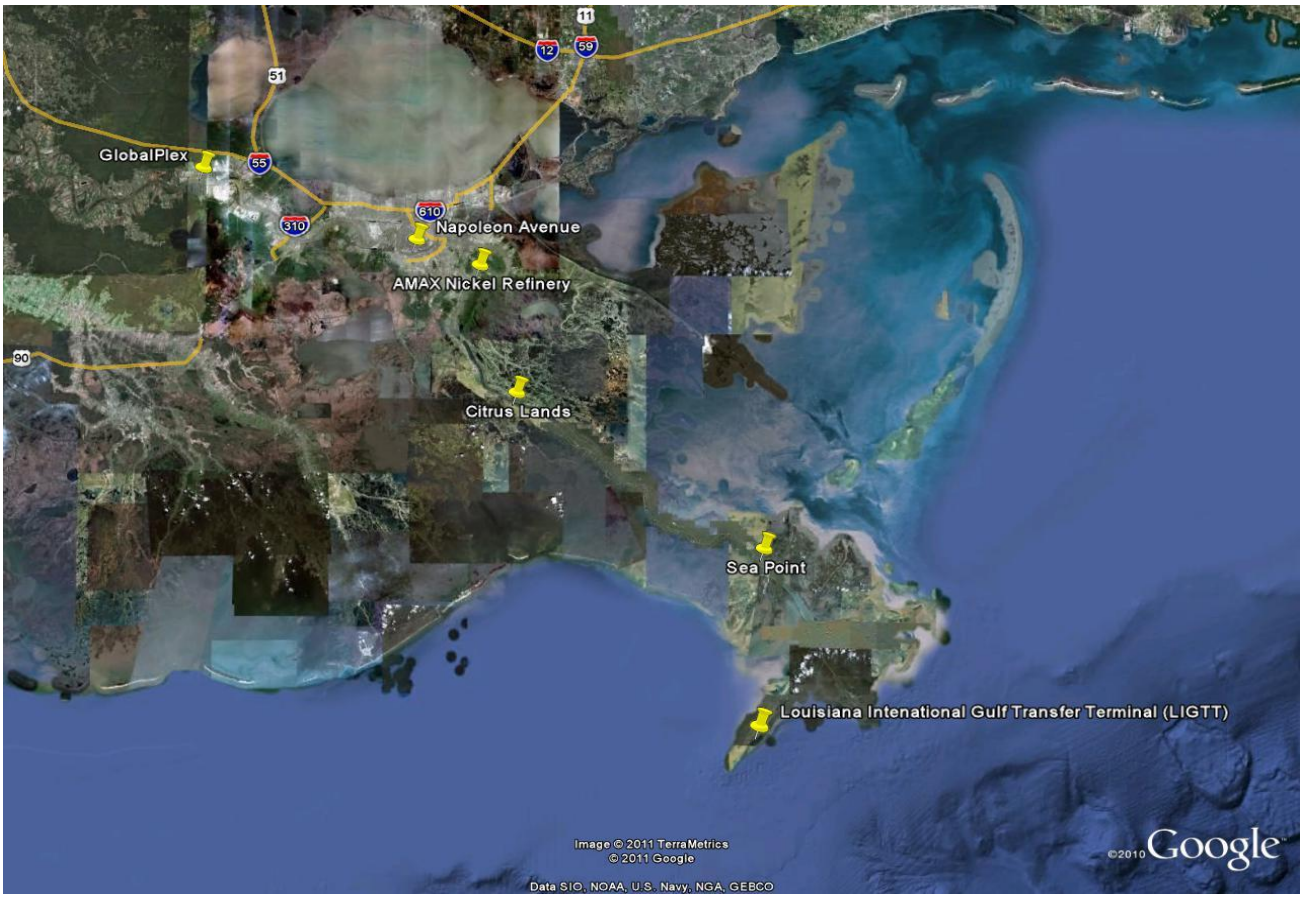
IWCT terminals. On-site inspections of these ports were made by members of the research team in conjunction with port officials and terminal operators. Staff members of the Regional Planning Commission were included in briefings and tours at ports located within the New Orleans region.

The following describes the ports researched and or visited, and their suitability as an optimal gateway or inland IWCT terminal

Table 7: Selected Gateway and Inland Port attributes

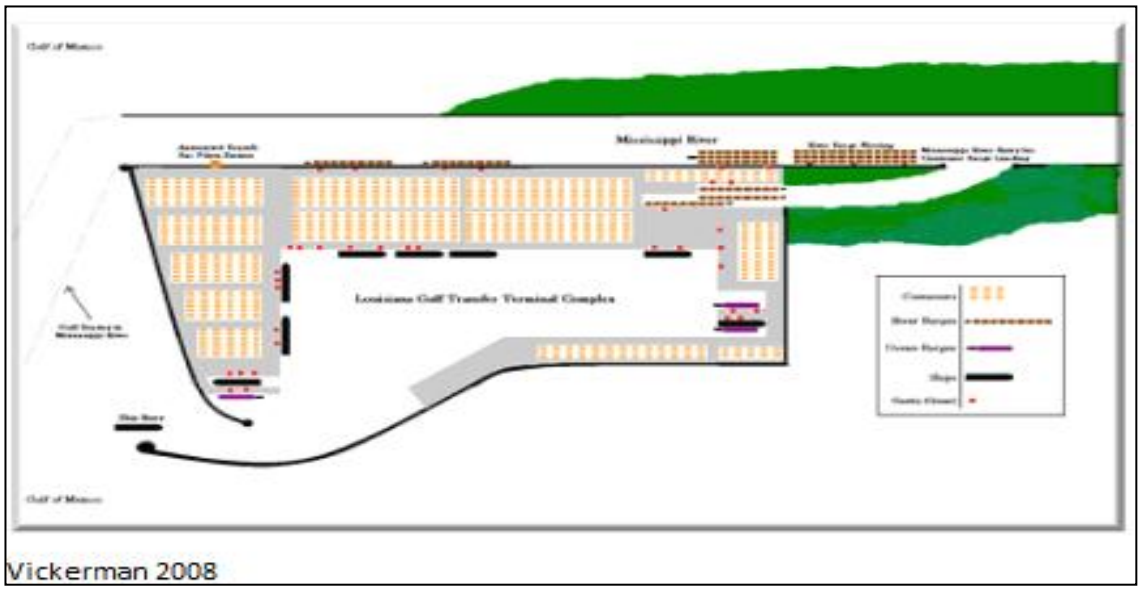
Selected Sites	Classification	Region	River Mile Location	Acreage for Terminal Development	Interstate Access	Rail - Direct(d) Indirect(i)
Citrus Lands	Gateway	Plaquemine	Lower West Bank MP 52-57	2,800	N/A	N/A
Amax	Gateway	Plaquemine	Lower East Bank MP 76	380	N/A	NS (d)
SeaPoint	Gateway	Plaquemine	Lower Bank MP 12	N/A	N/A	N/A
LIGTT	Gateway	Plaquemine	N/A	N/A	N/A	N/A
Napoleon Avenue	Gateway	Orleans Parish	Lower East Bank MP 99	70	I-10 E-W	CN (d) NS,CSX,BNSJ,UP (i)
GlobalPlex	Gateway	St. James Parish	Lower Eastbank MP 138.6	N/A	I-10 E-W / I-55 N-S I - 310	CN(d) KCS (i) UP (i)
Inland Rivers Marine Terminal	Inland	W. Baton Rouge	Lower West Bank MP 227	200	I-10 E-W	UP (d)
International Port of Memphis	Inland	Shelby County	Lower East Bank MP 725 - 740	210	I-55 N-S / I-40 E-W	CN (d)
Tri City Port - St. Louis	Inland	Madison County	Upper West Bank MP 185.5	75	I-70,64,44 and 55	(CN,BNSF,NS,CSX,UP,KCS) (d)

Figure 12 Gateway Port Locations



Source: Google Earth/ UNOTI

Figure 13 Conceptual Rendering LIGTT



A. The Louisiana International Gulf Transfer Terminal

Contact: John Hyatt @The Irwin Brown Co., Inc.

The *Louisiana International Gulf Transfer Terminal (LIGTT)* is a concept for a new container transfer hub located off Southwest Pass at the mouth of the Mississippi River. It is envisioned as the centerpiece of a new International Supply Chain that would incorporate Central and South American ports as well as ports along the Gulf of Mexico with an inland waterway transportation system. As planned, it would use the Mississippi River and other inland waterways systems totaling 14,500 miles to access the 33 states comprising the "US heartland" and 3 Canadian provinces from this new North American Gateway (LIGTT). It is being promoted both nationally and internationally by LA State Senator A.G. Crowe and the 17 members of the LIGTT Authority.

Estimated to cost in excess of $1B, the project would establish a new water based supply chain using the inland waterway systems in the US for short sea shipping and container-on-barge (COB) transport. LIGTT would be located on state land east of Southwest Pass at the mouth of the Mississippi River and licensed to private investors. The project would have a natural 80 foot draft allowing the world's largest ships to access the facility while requiring no dredging. Smaller feeder ships as well as COB would transport cargo from LIGTT to both Gulf and inland ports and

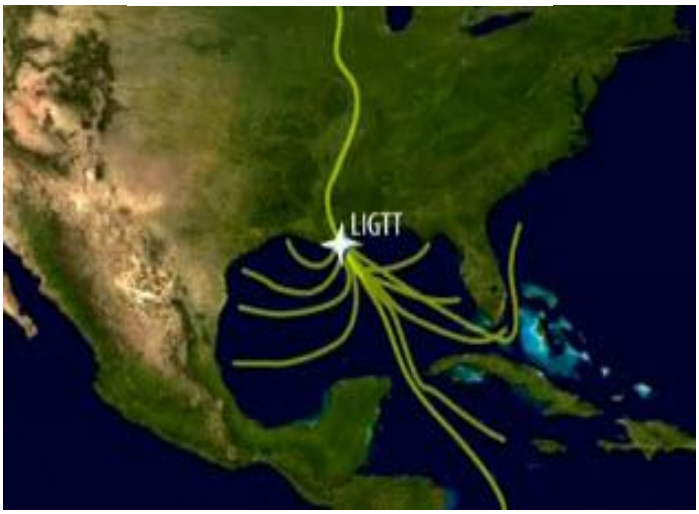
terminals. The first phase would require a 250 acre footprint. The project could be expanded in the future stages to include 1,000 acres or more. LIGTT would be fully automated, built at a more than 40' elevation for storm protection, could incorporate high tech detection devices for use by Department of Homeland Security and serve as a USCG base of operations. All required manpower would be accommodated on-site. LIGTT could also provide for value-added facilities. The project is currently being supported by the Panama Canal Authority.

LIGTT has 5 goals, as stated in their published materials:

1. Re-establish Louisiana as the Gateway to North America
2. Strengthen and grow all of the Ports of Louisiana by focusing on incremental business from large containerized cargo vessels
3. Serve as the only deep water port in the Gulf of Mexico
4. Open up opportunities for mega distribution centers all along the Mississippi River
5. Position Louisiana as a global destination

LIGTT is predicated on the ever increasing volume of international containerized cargo destined for North America, the Panama Canal Expansion and the resultant all-water trade route soon to be used by the largest container ships requiring at minimum 50' drafts.

Figure 14 **LIGTT Distribution Concept**



Source: Louisiana International Gulf Transfer Terminal Website

B. SeaPoint LLC (SPLLC)

Plaquemines Parish, Louisiana
Contact: Jonathan Redd @ SeaPointLLC

SeaPoint LLC is a proposed container transshipment terminal port. It is similar in concept to LIGTT but would be sited in Venice, LA. Located on the East Bank of the Mississippi River, the facility is envisioned as a $400 million offshore platform constructed to serve as a transfer point for containers between large ships and inland barges (COB). Its location at the lower end of the Mississippi River would preclude the need for ships to deliver their cargoes to the Port of New Orleans or other upriver ports, saving both time and money for the shipper. The project has been under development for a number of years and could be operational within two years, of the start of construction. All necessary federal and state permits have been secured. The project has also won approval from the State Bond Commission to use $300 million of Gulf Opportunity Zone bonds to help finance the facility.

Figure 15 Conceptual Rendering - SeaPoint

Source: SeaPoint website

C. Plaquemines Parish Port, Harbor and Terminal District

Plaquemines Parish, Louisiana
Contact: John L. Pennision at PPPHD

Plaquemines Parish Port, Harbor and Terminal District (PPP) was created by the state legislature in 1954. Its jurisdiction coincides with parish borders and extends from Head of Passes to 12 Mile Anchorage at MP81.7. The Plaquemines Parish Council governs the port. John L. Pennison serves as Port Manager in the absence of an Executive Director. There are 40 port employees. Tariffs totaled $3.5 million in 2008 based on 68 million tons of cargo, ranking PPP 12th in the U.S. in cargo

tonnage. Tariffs are used to pay the administrative staff as well as all costs associated with the three PPP fireboats that are in service at all times.

Although the PPP does not currently have a physical terminal to service the container trade, its geographical location closer to the mouth of the river serves as the gateway to deep water terminals along the Lower Mississippi River as well as inland ports within the entire Upper Mississippi Valley Corridor. Over 5,000 vessels transit thru the PPP annually. Within its boundaries, there are 12 anchorages from Pilottown downriver to the 12 Mile Anchorage, 79 miles upriver, as well as numerous private terminals. Two of the largest coal terminals in the country are located within the PPP: International Marine Terminals and TECO Bulk Terminal. These two landside terminals plus 2 mid-streaming terminals give the PPP almost limitless capacity to handle specific commodities. Primary inbound cargoes include: coke, carbon black feed stock, crude and fuel oil, IC 4, gasoline, heating oil, naphtha, natural gas, cobalt, petroleum products, phosphate. Outbound cargoes include: coal and grains (corn, soybean, wheat). All terminals currently serving the PPP are privately owned and operated.

Figure 16: Kinder Morgan Marine Terminal

Source: Plaquemines Parish Port, Harbor and Terminal District

Over the last 15 years, PPP has been identified by state officials as well as regional port and maritime interests as a likely location for a large maritime container and intermodal transportation hub. Originally identified as the Millennium Port, this concept has yet to be realized but it is still being pursued in various forms by both public and private interests. Two projects in particular are

pursuing investors at the present time. Sea Point is a container transshipment terminal port proposed for a site in Venice, LA. This terminal has a projected capacity in excess of 900,000 TEUs per year. Another project currently under development is the Louisiana International Gulf Transfer Terminal (LIGTT). This $1B terminal, targeted as a private sector investment, intends to reestablish Louisiana as the Gateway to North America and revitalize inland waterway transportation as the preferred mode of transportation to access Mid-America (33 states) and 3 Canadian provinces. This near shore terminal is envisioned as a deep water, 80' draft, facility located on the eastern edge of Southwest Pass. The first phase of the project would require 250 acres of facility footprint. However, to date, neither of these projects has been realized. (See Project Summary)

In light if these fluid development dynamics and competing maritime proposals, the Plaquemines Parish Council retained Trident Holdings in association with John Vickerman to prepare a, "Comprehensive Port Development Master Plan for Plaquemines Parish," in 2009. This recently completed project considered 10 potential sites for a new multi-modal transportation and distribution hubs. Based upon their analysis and evaluation 3 sites were selected for further consideration:

1) Citrus II on the Westbank (between MP52 – MP57 with 7000 linear feet of river frontage) 2) the former AMAX Metal Recovery Inc. property on the Eastbank,
3) the Venice location which would serve the Eastern Gulf Oil + Gas industry as well sports fishing, eco-tourism and potentially as a Federal and State oil-spill response center.

Both the Citrus Lands and AMAX properties could serve as a COB terminal, however rail service on the Westbank is severely limited. Other locations that have been considered for a port terminal complex include the former Freeport Sulphur property at MP 38 and a Boothville site at MP11.

Given its current status as a for sale property and its adjacency to East bank freight rail service provided by Norfolk Southern RR, the AMEX Nickel Recovery, Inc. facility at 3607 English Turn, Braithwaite, LA is a prime candidate for a COB terminal. This property, approximately 380 acres, is currently listed at $11 million with on-site improvements that include multiple industrial buildings (totaling 66,763 sf), a 52' x 510 concrete dock, a liquid handling dock, 386,000 sf of pile supported concrete foundations and an Entergy substation with 2 transformers.

In addition, the Regional Planning Commission conducted a feasibility analysis in 2002 to review route viability and cost for three proposed rail corridors that would enhance West Jefferson and Lower Plaquemines industry and potentially serve a new Westbank Plaquemines port site. More recently there has been interest in extending the existing freight rail corridor to serve lower

Plaquemines Westbank by the current owner of the track, the Rio Grande Pacific Corporation, the New Orleans Public Belt Railroad and others in response to multiple forays by various agencies into port planning initiatives in lower Plaquemines. The private sector has been risk adverse about making port investments without assurances of public sector funding to enhance rail access. However, COB or IWCT concepts would not necessarily require a rail extension into Lower Plaquemines. Containers could travel by barge or in modern 400 TEU vessels to upriver rail terminals in close proximity to the Mississippi River that connect products to markets.

D. Port of New Orleans Napoleon Avenue Container Terminal (NACT)

New Orleans, Louisiana
Contact: Bobby Landry @ Port of New Orleans

Located on the East Bank of Orleans Parish, at 99.5 AHP, the NACT is a port owned facility occupying 61 acres of land. The terminal is a shared operation between Ports America Louisiana, Inc. and New Orleans Terminals, Inc. It includes 2 berths totaling 1,400 linear feet, a 48 acre marshaling yard and handled 426,091 TEUs in 2010, a 31% increase over 2009. The facility operates 4 multi-purpose gantry cranes as well as 4 rubber tire gantry cranes. It features state-of-the-art computerized portals at the gate plaza that enable transponder equipped trucks to communicate all necessary information before accessing the facility. NACT is served by Mediterranean Shipping Company, Hapag-Lloyd, Maersk, Seaboard Marine and CSAV.

Figure 17 Napoleon Avenue Container Facility

Source: Port of New Orleans

E. Port of South Louisiana (PSL) Reserve, Louisiana

Contact: Linda Prudhomme @ PSL

The PSL is the largest tonnage port in the western hemisphere. Its jurisdiction stretches along 54 miles of the Mississippi River with facilities located in St. Charles, St. John, and St. James parishes. In toto, there are 108 miles of deep-water frontage on both banks of the River that include more than 50 docks and terminals each with a 45' draft. In 2010, PSL handled over 246 million short tons of cargo. According to its website "over 4,000 oceangoing vessels and 55,000 barges call at the Port of South Louisiana each year, making it the top ranked in the country for export tonnage and total tonnage" accounting for 15% of total US exports and 57% of Louisiana's exports.

Figure 19 PSL Barge Fleeting and Midstream Operations

Source: Port of S. LA

Figure 19 GlobalPlex Intermodal Terminal

Source: Port of S. LA

Port-owned facilities include the Globalplex Intermodal Terminal, grain elevators and general cargo facilities. These facilities are leased to a variety of tenants including Archer Daniels Midland and Occidental Chemical. However, the majority of terminals and storage facilities are owned and operated by private sector interests.

PSL also is well served by I-10, 1-55 and I-59 each providing direct highway connections to both the East and West coasts as well as Mid-America including Chicago, Detroit and St. Paul. State highways serve as feeders to these interstates. PSL is also served by three Class 1 railroads (CN and KCS on the East Bank serve Mid America, Canada and Mexico while Union Pacific on the West Bank serves the western US markets).

In recent years, PSL has promoted a new 7,700 foot dock and container terminal at the Bonnet Carre Spillway projected to cost a minimum $500 million. If fully developed with value-added

assembly facilities, warehouse and distribution facilities and new rail connections, the cost could increase to $2.5B. This project is being driven, in large part, by the increased traffic expected when the Panama Canal Expansion is completed in 2014-2015.

F. Port of Greater Baton Rouge (PGBR)

Port Allen, Louisiana
Contact: Greg Johnson

The PGBR is located on the West Bank of the Mississippi River, across from Baton Rouge, in Port Allen, LA at the convergence of the Gulf Intracoastal Waterway (GIWW) and the Mississippi River. These extensive waterway systems connect the PGBR with major ports located along the GIWW from south Texas to north Florida, along with other inland ports located up and down the MR and along its upriver tributaries. The PGBR is the upper terminus of Louisiana's deep water ports accessed by a 45 foot navigation channel maintained by the USACOE. With maritime connections provided by both the Mississippi River and the GIWW, the PGBR has been a location for Osprey's COB service in recent years. The port has developed the Inland Rivers Marine Terminal as a domestic barge terminal specifically built for handling shipping containers delivered either by ship or barge. This facility has a 10 acre private container marshaling yard plus a 4 acre public container marshaling terminal. On site facilities include value-added facilities such as a cross dock stuffing and bagging operation.

Figure 20 Osprey Lines Locking Through at Port Allen Locks

Source: Osprey Lines

The PGBR provides a full range of facilities for the handling and storage of bulk, break bulk, project and heavy lifts cargo as well as containers. Primary cargoes include: grain, petroleum, molasses, rail, coils, pipe, various other steel products, liquid and bulk chemicals, building and construction materials, coal and coke, sugar, containers. The general cargo dock is capable of handling project cargo and heavy lifts. Roughly 66% of the port's cargo tonnage is domestic with the remaining foreign cargoes split 75% import and 25% export.

The actual jurisdiction of the port extends from river mile 168.5 AHP at the Sunshine Bridge to 253 AHP at the Exxon Mobil Refinery. This is a total of 85 miles along both banks of the Mississippi River within Ascension, East Baton Rouge, Iberville and West Baton Rouge parishes. The PGBR, "is located adjacent to I-10 and is in close proximity to US Interstate 12, 49, 55 and 59 and U.S. Highway 61, 65, and 90 and LA Highway 1. The port has daily rail switching services to the Union Pacific Railroad, Kansas City Southern Railroad, and the Canadian National Railway. The port has access to all major U.S. truck carriers" (Port of Greater Baton Rouge 2011).

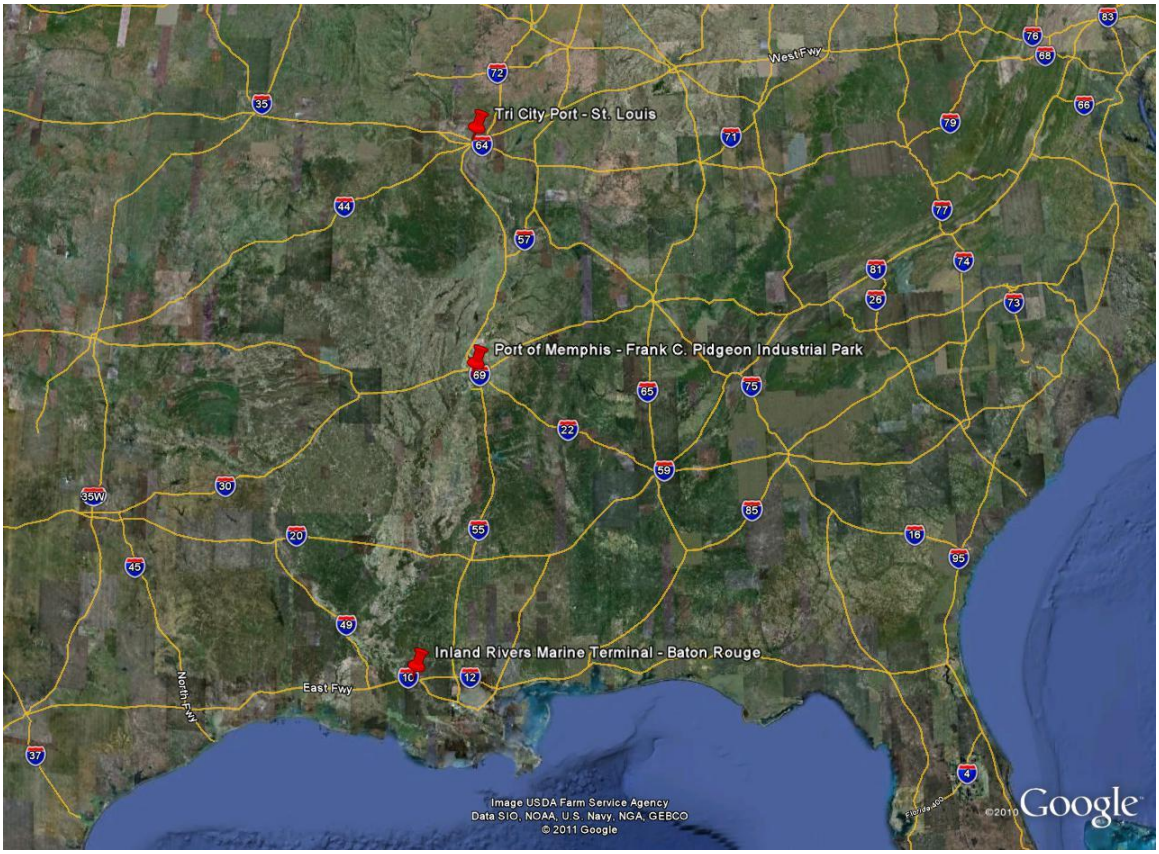
G. International Port of Memphis (POM)

Memphis, Tennessee
Contact: Michael Moyer, Operations Manager

The International Port of Memphis is located immediately downriver of Memphis' Central Business District. POM's jurisdictional boundary extends from River Mile 725 to River Mile 740. It is located 600 river miles upstream of New Orleans and 400 river miles downstream of St. Louis. POM is the 4th largest inland port in the US with cargoes totaling over 18 million tons annually and has an annual economic impact in excess of $5 billion. POM is served by 3 still water harbors and has 5 public terminals.

The POM manages two separate properties. Presidents Island is a 7500 acre property with 1200 acres dedicated to industrial uses with an additional 3000 acres in agricultural use, and a 3300 acre tract designated as a TN Wildlife Management Area. President's Island is the POM's primary location for maritime users and industrial facilities. The Frank C. Pidgeon Industrial Park (PIP), site of a potential COB terminal, is an 8100 acre property with 2800 acres available for development which is located just downriver of President's Island. Currently, PIP has 1100 acres utilized by public utilities, 1200 acres used by private industries, and 3300 acres presently undeveloped woods and fields.

Figure 22: Inland Port Locations



Source: Google Earth with notations per **UNOTI**

The POM operates as a landlord port with extensive acreage, both developed as industrial property and undeveloped land used primarily for interim agricultural uses. POM's primary function is to manage their facilities and property and maintain flood protection levees within their jurisdiction. POM President's Island is served by an 8 mile long still water harbor with a 300' wide x 9' deep USACOE maintained channel. Currently 68 of POM's facilities have harbor frontage. There are a total of 174 industrial locations on-site including a 53 acre public facility. POM uses as a key selling feature that it is an ice free facility during winter with no locks or dams between it and the Gulf of Mexico.

Figure 23 Frank C. Pigeon Industrial Park

Source: Google Earth with annotated notes per UNOTI

The POM has a potential Container on Barge terminal site at Pidgeon Harbor. Located within the Frank D. Pidgeon Industrial Park, it is the largest municipally owned industrial park in the nation. The 800 acre undeveloped site is adjacent to an existing harbor that was created 15 years ago. The site is1200 feet off the river and is scheduled to have rail access within 18 months. CN's new "Intermodal Gateway Memphis" serves as the development spine for this industrial park. The proposed COB site is an "empty canvas", according to Operations Manager Michael Moyer; "It's a greenfield site." It could be developed in conjunction with an overweight truck corridor providing access to CN's new intermodal facility, located in close proximity to the site. Since all adjoining properties are either agricultural or industrial, zoning would not be an issue.

Fullen Dock and Warehouse (FDW)
Memphis, Tennessee
Contact: Lanny Chalk, Terminal Manager

Fullen Dock and Warehouse is a full-service intermodal river terminal and warehousing facility that provides dock, port, storage and transportation services to the greater Memphis area. FDW markets themselves as the intermodal transportation provider for the region. Their facilities are located upriver of the Memphis Central Business District at Mile 740. According to their website FDW is near the junction of I-40 and I-55 and has open rail access to CSXT, Burlington Northern, Union Pacific and Norfolk Southern. FDW's location, in the center of the country, gives the company the ability to access roughly 75% of the U.S. population by overnight transit. FDW also offers an on-site trucking partner in Jimmy T. Wood, Inc. to facilitate scheduling and logistics. Cargo types handled at FDW include: aggregate stone, limestone, bulk materials, plate steel, ferroalloys, heavy lifts and oversized cargo, structural steel and steel coils, super sacks, container-on-barge.

Figure 24 Fullen Dock Floating Barge

Source: Osprey Lines

Figure 24 Fullen Dock-ramp

Source: Osprey Lines

Figure 25 Osprey Lines Largest Tow at Fullen Dock

Source: Osprey Lines

FDW served as the northern most terminal for Osprey Lines' COB service while it operated along the Mississippi River. Terminal Manager Lanny Chalk reviewed FDW's history with COB. This service began in the summer of 2004 with cotton but the COB service was suspended in October, 2009 due to the economy, and more particularly, the lack of northbound cargo. Southbound cargo was primarily hazardous material and agricultural commodities, specifically cotton destined for Turkey. Northbound cargo was roughly 75% overweight international containers originating from the Port of New Orleans. Initially a large number of empty containers used COB for repositioning.

The FDW terminal has the capacity for 1,000 40 ft. containers and currently owns 600 acres of undeveloped land adjacent to their existing operations, which is primarily used for uncovered storage of aggregate products. FDW also has access to covered warehouse space in a former International Harvester plant located adjacent to their property. Presently FDW has one loading and five unloading docks. In 2005 FDW purchased a 250-ton lattice with a 120 foot boom crane to increase their operating efficiency to a maximum capacity 30 TEUs per hour. While in service, 10,000 containers per year were handled at this terminal. Cotton started COB service in midsummer 2004, when twenty five 40-foot containers were loaded on each of four barges daily. A standard barge can

carry 90 TEU, at a twenty foot equivalent, while newer jumbo barges can handle roughly twice that number.

According to Mr. Chalk, steamships need to be the prime force behind the COB service if this alternative mode of transport is to succeed. Osprey did a lot of business with MSC Industrial Supply Company and Seaboard Marine in New Orleans. Mr. Chalk feels that steamship lines are important because they have existing partnerships with the railroads to deliver northbound traffic. The COB cost per container is $50 - $100 less than rail. Truck rates are twice that of rail per box. "It is very important that a market niche be found, such as hazmat cargoes, project cargo, or overweight containers. Then COB will work." Historically, export markets were primarily European. He noted that reliability is a key variable. In addition, barge services can offer operating flexibility since they can function during off hours. Tax credits, regulations on hazmat cargo or other external factors could be used as incentives. When asked if he would restart COB, he replied "we could be back in operation in 15 minutes, if the market was there. We liked the business." Finally, he believes a key to the success of COB is to use large volumes or blocks of specific destination cargoes loaded as such on the carriers.

H. Americas Central Port –Tri-City Regional Port District

Granite City, IL
Contact: Dennis Wilmsmeyer, Executive Director

America's Central Port (ACP) is a 1,200-acre facility located in southwestern Illinois across from St. Louis, MO. It is managed by the Tri-City Regional Port District, a special purpose unit of local government for the State of Illinois. Strategically located in the heart of the U.S. on the Mississippi River, the port is primarily an export barge port with a 6,000 foot harbor moving outbound steel and grain destined for New Orleans and asphalt inbound for the Greater St. Louis Region. The Tri-City Regional Port Distrtic (TCRPD) currently handles 3.5 – 4 million tons of cargo per year using river barges, rail cars and trucks. The harbor currently serves 2,500 barges annually. TCRPD has bulk liquid, dry bulk, general cargo, steel and fertilizer terminals on-site.

ACP holds the license and Grant of Authority for Foreign Trade Zone #31 consisting of 500 acres on-site as well as several off-site locations. As such, ACP is a gated facility with around the clock security. It currently serves as the mid-continental intermodal transportation hub for dry and liquid bulk products and general cargo.

The port was established in 2002 as part of a federal conveyance. It currently occupies 1,200 acres, of which 600 acres are undeveloped. It includes 1.7 million square feet of warehouse space, which is 93 % occupied, and has 10 miles of on-site rail track. A $200million, 88 million gallon ethanol plant opened in 2009, owned and operated by Abengoa Bioenergy, a Spanish company. A Memorandum of Understanding, signed in 2009, is currently in effect between ACP and the Port of New Orleans for joint marketing efforts.

ACP was originally a military base that included a golf course, 150 units of housing and a functioning dock upriver of Lock #27. The TCRPD has proposed a new harbor and $30 million in related landside improvements to be used for Bioenergy bi-products to be transported by approximately 850 to 1,000 barges per year. The proposed harbor could handle a total of 2,500 barges per year. To date Tri-City's only history with COB was in 2005 with two barges of empties. Northbound cargo is lacking. Tri City has overweight corridors on site, which is recognized as a unique asset.

Figure 26 America's Central Port

Source: Tri-City Regional Port

ACP has reserved 75 acres for a future slip harbor and landside support facilities to be located south of Locks and Dam No. 27. The envisioned landside improvements include a Steel Distribution Center, a Roll-on/Roll-off dock, as well as a general cargo and dry bulk handling facility. When completed the new harbor and associated facilities are meant to be container centric. This harbor, when realized, would be a prime candidate for a COB terminal serving Greater St. Louis and the mid-continent. As of August 2011, the port was awarded an $8.5 million Transportation Investment Generating Economic Recovery (TIGER) grant to begin construction of its proposed South Harbor, located just south of Locks 27 on the Mississippi River. With an additional $4 million in matching

state funds, the construction of the project is set to begin this winter. The South Harbor will allow all six Class1 railroads, four Interstate highways and a public inland waterway to connect in a lock free environment. Delays caused by bottlenecks around the locks and dams will be eliminated allowing much faster transfers of cargo between barges and landside modes.

Figure 28 Conceptual Rendering of South Harbor Facility Improvement Project

Source: Americas Central Port Website

Located immediately upriver on the Illinois side of the Mississippi River, ACP serves the greater St. Louis area, a regional distribution hub. For port facilities, the Missouri side of the river is landlocked so the only growth option is on the Illinois side. St. Louis is served by five Class 1 railroads as well as a terminal railroad which owns both bridges crossing over the Mississippi River. Gateway Commerce Center has been recently developed as a major distribution hub several miles east of ACP.

Figure 27 Memphis Regional Freight Infrastructure Plan Study Area

Image Source: Memphis regional freight infrastructure plan executive summary, retrieved from: http://www.memphischamber.com/Articles/DoBusiness/Aerotropolis/Memphis-Regional-Freight-Infrastructure-Executive-.aspx

Section 6. Freight Transportation Profiles of Memphis and St. Louis

A. Memphis – America's Distribution Center

Today Memphis is known as America's Distribution Center offering air, rail, interstate highway systems and maritime systems. Memphis also serves as a distribution hub for the Mid-South region of the U.S. but is not a major consumption market. Memphis is home to the world's largest air-cargo airport, is served by five Class 1 railroads (CN, BNSF, CSX, NS, UP), has 490 trucking terminals, and is the United States' 4th largest inland port. The city has a robust intermodal freight infrastructure which transported more than 11 million tons, worth $23 Billion, of cargo in 2007. Memphis ranks 4th in total volume of international freight after Chicago, St Louis, and Dallas, and 3rd in value of international freight after Chicago and Dallas.

Table 8: Total International Land and Water Trade in Memphis Region, 2007

	Imports	Exports	Total
Tons in millions	6.21	4.99	11.20
Value in billions	$16.9	$6.3	$23.1

Table data source: IHS global insight United States Inland Trade Monitor

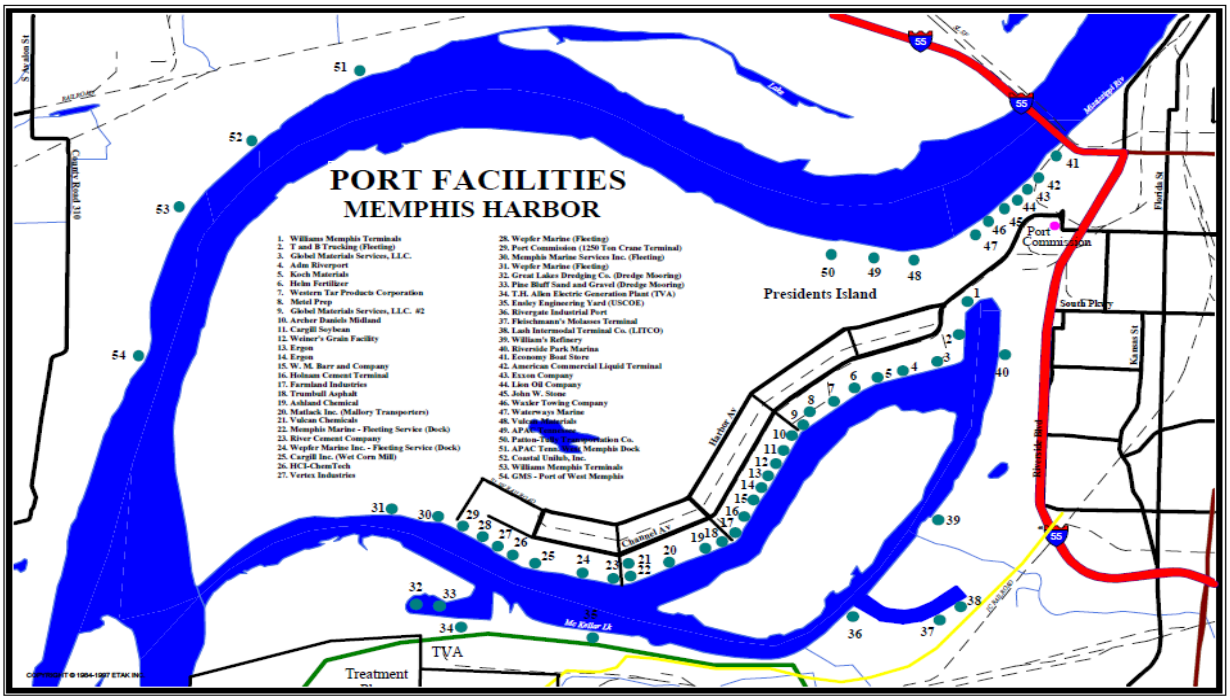
The rail industry has invested over $500 Million in intermodal rail infrastructure in the region, and intermodal rail traffic is expected to double to over 2 million containers from 2007 to 2035. The Memphis area has a total of 19 intermodal freight terminals, four are rail-truck terminals, 12 are rail-truck-marine terminals, and three are air-truck terminals at Memphis International Airport. Memphis imports substantial goods from the Pacific Rim from the ports of Los Angeles and Long Beach, and exports bulk commodities through the Port of New Orleans and higher-value goods through East Coast ports to Europe. Container traffic dynamics, by sea and land, are expected to shift somewhat as a result of the expansion of the Panama Canal by 2015. This could result in up to a 25% decline in West Coast container traffic, and consequent increases in Gulf and East Coast ports, as well as offshore and Caribbean port facilities. This may decrease Memphis' logistic competitiveness as a major transfer hub.

Despite today's economic recession and unpredictable fuel costs, air freight has remained a critical component of Memphis' freight industry, serving as the hub of Fed Ex, for the transport of high-value and time-sensitive cargo. Overall, however, the economic recession has led to increases in rail and water transport, and declines in air and truck transport.

Marine Transportation:

Within the Memphis region there are 99 Mississippi River port terminals, 62 of which are within the International Port of Memphis. In 2007, this port system transported 21 Million tons of international and domestic freight.

Figure 28 International Port of Memphis



Source: Rand McNally & Company 1999

A need for better rail-truck accessibility to river terminals has been identified particularly for the terminals at Frank C. Pidgeon Industrial Park, the Port of Helena, and the Port of Cates Landing, along with continued dredging to maintain sufficient river depths, in order to maximize the capacity and efficiency of marine intermodal operations. Several studies have been conducted on the potential for expanding river port service with Container-on-Barge, although to date this has resulted in little new activity for the region.

Water transportation accounts for 23% of Memphis' total share of freight transport by volume, but only 2% by value (See table 2). Dominant commodities include grain which is 12% of total land and water trade by ton, much of which is transported south through the Mississippi River to the Port of New Orleans. Rail transportation, meanwhile, accounts for 66% of international imports and exports by weight and 85% by value. Memphis handles a diverse array of import and export commodities, and serves diverse geographic origins and destinations, lending to the region's strength

and stability in this industry. This strength is compounded by the high degree of multi-modalism within the region, which provides greater flexibility for shippers.

Table 9: Total International Land and Water Trade in the Memphis Region by Mode 2007

Mode	Tons in millions	Share	Value in billions	share
Rail	7.7	69%	$19.8	85%
Truck	.9	8%	$2.8	12%
Water	**2.6**	**23%**	**$.5**	**2%**
Total	11.2	100%	$23.1	100%

Source: IHS global insight United States Inland Trade Monitor

Broken down into import and export categories, water transport accounts for 13% of imports by volume but only 1% of imports by value, and 38% of exports by volume and 6% of exports by value (Tables 3 and 4). Bulk commodities moving through the Port of New Orleans account for this discrepancy, as higher-value exports tend to be transported by rail to East and West Coast ports for shipment. Overall, there is an imbalance between import and export trade in the region. Memphis is a net importer of goods, resulting in an availability of empty containers and equipment which must be repositioned. Containerization in Memphis, as elsewhere, is on the rise. However, only 10% of water imports and a negligible percentage of water exports were containerized as of 2007 (Table 5).

Table 10: Total International Land and Water imports in the Memphis Region by Mode 2007

Mode	Tons in millions	Share	Value in billions	Share
Rail	4.82	78%	$14.48	86%
Truck	.58	10%	$2.24	13%
Water	**.78**	**13%**	**$.16**	**1%**
Total	6.19	100%	$16.87	100%

Source: IHS global insight United States Inland Trade Monitor

Table 11: Total International Land and Water Exports in the Memphis Region by Mode 2007

Mode	Tons in millions	Share	Value in billions	Share
Rail	2.84	58%	$5.29	85%
Truck	.29	6%	$.57	9%
Water	**1.84**	**38%**	**$.39**	**6%**
Total	4.98	100%	$6.25	100%

Source: IHS global insight United States Inland Trade Monitor

Table 12: Percent of Imports and Exports Containerized by Mode 2007

Mode	% of Imports Containerized	% of Exports Containerized
Rail	87%	74%
Truck	65%	47%
Water	**10%**	**3%**

Source: Memphis Regional Freight Infrastructure Plan

REFERENCE:
Global Insight (2009). Memphis Regional Freight Transportation Plan. Retrieved from:
http://www.memphischamber.com/Articles/DoBusiness/Aerotropolis/Memphis-Regional-Freight-Infrastructure-Plan-March.aspx

B. St. Louis Metro Area

The St. Louis Metropolitan Area is situated close to the geographic center of the U.S. Located within 500 miles of 1/3 of the U.S. population and within 1,500 miles of 90% of North America's population and GDP the St. Louis Metropolitan Area is ideally situated as an intermodal distribution hub. In 2007, *Expansion Management* ranked St. Louis # 2 of the "Top 10 Logistics Metros" in the U.S. Additionally, St. Louis' freight market is well balanced between imports and exports, reducing the need for repositioning of empty railcars, trailers and containers. Over the last five years, intermodal cargo, by the ton, has grown by 66%, compared to a national growth rate of 40% (Gateway Commerce Center 2011).

The St. Louis Metropolitan Area is served by "an unsurpassed transportation infrastructure", according to a recent report sponsored by Ameren Economic Development. This report, "Competitive Marketing Analysis – Wholesale Trade" is an analysis of Sector 42 of the North American Industry Classification System, which the consultant team defines as "the management and movement of materials in large volumes, mostly among business and industrial facilities, before they are sold to the retail customer" (Ameren Economic Development, ND, p. 3). In the metro St. Louis region, Sector 42 represents "roughly 60,000 people that are employed in over 4,000 establishments that occupy 12 million square feet of distribution and warehouse space" (Ameren Economic Development, ND, p. 3). This report stresses the region's transportation infrastructure as a key asset. With its extensive interstate and highway network in good repair, minimal levels of congestion, service by all Class 1 railroads, an international airport that handles over 210,000 tons of air cargo annually, several regional airports, a number of intermodal terminals that service rail to truck transfer, as well as diversified maritime facilities including both public and private terminals, the region is in a good shape. What is most significant, according to Ameren's consultants, is that these individual transportation assets work as a comprehensive and mutually supportive network.

Taken altogether, the region serves as a storage, transfer, and distribution point for domestic and international cargo with origins and destinations on all North American coasts with connections to both Canada and Mexico. The St. Louis area ranks 10th in the US for originating shipments and 12th for received shipments with significantly more outbound shipments than inbound.

The Metropolitan Port of St Louis is composed of six separate port authorities. There are three authorities in Illinois: Tri-City Regional Port District, Kaskaskia Regional Port District and Southwest Regional Port District. Three more authorities in Missouri: Jefferson County Port Authority, St. Louis County Port Authority, and City of St. Louis Port Authority. The resulting Metropolitan Port covers 70 linear miles of the Mississippi river extending from the southern border of Jefferson County, MO to the northern border of Madison County, Il. The St. Louis region encompasses the Mississippi, Missouri, and Illinois rivers. It is the nation's second largest inland port by servicing over 24 billion trip ton-miles per year and the third largest inland port by tonnage, servicing over 31 million tons per year. Inland waterways play a significant role in the transportation of bulk commodities to the St. Louis region; Illinois has 1,095 miles of commercially navigable waterways while Missouri has 1,033 miles. These waterways connect St. Louis to the Gulf of Mexico from the Mississippi, to Kansas City and Sioux City through the Missouri River and Peoria-Chicago- the Great Lakes- St. Lawrence Seaway through the Illinois River.

The Metropolitan Port of St Louis includes more than 130 primarily private docks and terminals, 55 barge fleeting areas, and is the northernmost year-round ice-free Mississippi River port. South of St. Louis, the Mississippi River offers unimpeded access to New Orleans and the Gulf, with no locks or dams. (Hook 2005). The St. Louis Metropolitan Area also includes two foreign trade zone (FTZ) sites which provide economic benefits to shippers operating within their boundaries including duty reduction or elimination and simplified customs procedures.

The City of St. Louis Port Authority encompasses nearly 20 miles of the Mississippi River above the confluence of the Ohio River. It includes 16 terminals with direct access to four major interstates and six Class 1 rail lines. Nick Nichols, operations manager for the St. Louis Port Authority, notes that the ability to transport heavy commodities by waterway results in substantial savings for shippers, giving St. Louis a competitive advantage (Hook 2005).

The St. Louis intermodal freight network is enhanced by a variety of Distribution Centers. These include the Gateway Commerce Center, a 2,300 acre warehouse and distribution hub, whose tenants include Hersey, Unilever, Procter & Gamble, Dial and Save-A-Lot. Support infrastructure

includes high capacity electric, natural gas, water, sewer and telecommunication systems. All internal roads are designed to interstate standards, with a 40 ton vehicle rating. Tenants and owner occupants have access to highway, rail, air, and water transport facilities. The adjacent Triple Crown Services Co. is a 62 acre intermodal commercial distribution facility (Gateway Commerce Center 2011).

Section 7. Findings & Conclusions

Over the last several decades a number of ventures have offered regular IWCT services using facilities along the Mississippi River for landside terminals and support infrastructure. Currently, no company offers a regular service for IWCT on the river. After an exhaustive investigation of physical and market conditions within the region and along the Mississippi River Trade Corridor, we conclude that the basic deterrents to IWCT are related to market conditions and not the physical support infrastructure.

Landside infrastructure exists at several ports within the New Orleans region, as well as upriver within the unlocked portions of the river, to support IWCT. The Port of New Orleans has existing infrastructure in place to service IWCT at their Napoleon Avenue Container Terminal. The Port of South Louisiana, at its GlobalPlex location, has adequate infrastructure available for IWCT, but insufficient on-dock container storage at the present time. The Port of Greater Baton Rouge currently includes the Inland Rivers Marine Terminal specifically designed and constructed to serve IWCT. This facility features a barge dock, a four acre container marshaling yard and a 42,000 ft^2 rail served warehouse. Upriver, in Memphis, there are two existing terminals previously used for IWCT as well as an undeveloped site suitable for an IWCT facility at the Frank C. Pidgeon Industrial Park. In the St. Louis area, a barge harbor is currently under construction at the Tri-City Regional Port District. This clearly demonstrates that adequate infrastructure exists within the unlocked portion of the Mississippi River to support IWCT.

There also exists in the New Orleans region several potential “greenfield sites” suitable for IWCT terminals. These include the former AMAX Nickel refinery at milepost 76 on the east bank of Plaquemines Parish as well as a west bank location at roughly mile marker 46. Within the Port of South Louisiana, there is ongoing discussion about the development of a container terminal at the Bonne Carre spillway located between mileposts 127 to 129 on the east bank.

Unbalanced trade flows and inadequate container volumes are two big challenges for the success of IWCT on the Mississippi River. Previous services have failed primarily due to two separate but related issues. Downriver container volumes were sufficient to support IWCT but the lack of upriver container traffic created an unbalanced trade flow. Furthermore, the general lack of container movements along the Mississippi Trade Corridor remains a challenge for all transportation modes. However, these conditions may soon change given the expansion of the Panama Canal in 2014 and the potential development of two proposed transfer terminals at or near the mouth of the river. One or more of these developments may create the upriver container volume necessary to support IWCT on the Mississippi River and create a more balanced trade flow along the river. They could also contribute to a "multi-port gateway system" within 100 miles of the Gulf of Mexico along the Mississippi river to accumulate a critical mass of international containers (1M+/year). This is imperative for IWCT to be successful using the river and its tributaries. By comparison, both Rotterdam and Antwerp are located within a 50 mile distance to open waters of the North Sea and together handle over 3 million containers.

At the regional, state and national levels of government, there has been insufficient support for policies and programs that will influence a modal shift of cargo transportation movements from land to water. Europe has robust policies in place, supported by financial structures, that purposefully shift cargo from land to water. To date, this has not happened in a serious and sustained manner in the US. Consequently, positive success stories of US IWCT services are few and their total impacts, to date, have been minimal on the overall surface transportation networks serving the nation.

External factors may also cause this modal shift in the US. These include the cost of fuel, air quality standards and increasing levels of congestion on both the rail and road networks. Macroeconomics may also influence the growth of international trade. Each of these will play an incremental role in the sustained development and growth of IWCT along the Mississippi River and within the nation's inland waterway system.

A final benefit of IWCT is its ability to act as a redundant surface transportation network in the event of a major road or rail disruption. IWCT can provide an additional and complementary mode to the nation's surface transportation system in times of natural or manmade disaster.

Section 8: Recommendations

Over the past two decades, the US Department of Transportation's Maritime Administration has initiated a number of programs and policies to encourage the private sector to make better use of maritime assets. These have included demonstration projects, sponsored research programs and limited financial incentives to foster maritime transport, using both coastal waters and inland waterways, as a natural extension of our surface transportation networks. To date, these have proven ineffective or of marginal impact. There have been a few creative projects that have used a combination of state and federal programs to launch new services; however their overall benefits have been minimal. New policies and programs need to be developed and funded in a meaningful way if IWCT is to become a viable alternative in our national transportation network. At the regional and state level, several options should be considered for fostering IWCT.

- Create fuel tax incentives for IWCT vessels.
- Dedicate a percentage of future CMAC funds for the New Orleans region to foster IWCT's role in enhancing air quality and reducing congestion on our regional roadway and railroad networks.
- Incentivize the local ship building industry to design and build shallow draft, motorized ships to carry up to 400 TEU's for river transport
- Encourage the 3rd party logistics industry to promote IWCT as a viable mode
- Expand research activities to include scenario planning for a resilient freight transportation network in times of duress; validate or revise the conceptual plan of the proposed deep draft facility at Head of Passes (LIGTT) based on shipper input and assess its implications for other Mississippi River Ports along the corridor (Gulf to St. Louis).

Based upon our collective efforts during this research project, it has become quite clear that past efforts and present programs have not caused a significant shift of freight movements from our surface transportation networks to either or inland or coastal waterways. All stakeholders need to be involved in a targeted program to maximize the natural asset of our unique location and that of the Mississippi River to the benefit of all affected parishes, cities, ports, industries as well as Louisiana and upriver states.

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