

Asset Utilization Potential of Building a Trucking and Rail Intermodal Hub in the Saint Louis Region

Final Report
July 2018

Sponsored by

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ASSET UTILIZATION POTENTIAL OF BUILDING A TRUCKING AND RAIL INTERMODAL HUB IN THE ST. LOUIS REGION

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INTRODUCTION

Annually, more than one billion tons of cargo passes through St. Louis, making it the “Gateway to the West” as termed by the Missouri Economic Research and Information Center (2014). In Missouri, 45% of all cargo traffic moves by railroad, and 49% is transported by truck (MoDOT 2017). As trade continues to flourish in the region, there is increased shipper and carrier demand for making St. Louis an intermodal hub in order to optimize the region’s strategic location, increase profit, and lower transportation costs.

The objective of this study was to assess the asset utilization potential of building a trucking and rail intermodal hub in the St. Louis region by looking at industry history, examining transportation policies and initiatives in the St. Louis region, and evaluating the major stakeholders affected by intermodal initiatives. Because today’s transportation development decisions greatly impact environmental and economic sustainability, in addition to community welfare, the research project also focused on whether a common intermodal hub in St. Louis would minimize trucking and railroad operational and economic costs. The topics of property rights, externalities, net benefit to society, and technological growth are discussed in this report. Case studies of other cities in the United States that have had success with intermodal development are also presented in this report.

The primary methodology for this project focused on geospatial mapping of providers in the St. Louis region. This information was used to provide a detailed analysis of the creation of a railroad and trucking hub in St. Louis to facilitate the interaction of intermodal trade.

The study explained the primary benefit of reducing intercity transfer costs to showcase the benefits and limitations associated with a common intermodal hub expansion in the St. Louis region. The authors concluded that the benefits outweigh any negatives and proposed the ideal location of the intermodal hub in St. Louis.

Problem Statement

The economic well-being of the St. Louis region depends a great deal on its ability to utilize diverse transportation modes to move freight and goods between producers and markets. The goal of this research project was to assess the viability of building a centralized trucking and rail mega intermodal hub to shift freight from trucking to railway in an effort to ease logistical operations, alleviate highway traffic congestion and costs, increase industry safety, decrease infrastructure deterioration, decrease infrastructure costs, and ensure benefits to all stakeholders. The research question that this report carefully considered included explaining asset utilization potential of building a common rail and trucking intermodal hub in the St. Louis region.

Literature Review

Various studies exist on the benefits of utilizing freight railways and developing intermodal hubs. The following is a discussion of some of that research.

- Association of American Railroads (2013)

Railroads offer substantial public benefits, including fuel efficiency, reduced greenhouse gases, and less highway congestion. On average, railroads are four times more fuel efficient than trucks. In 2012, railroads moved a ton of freight an average of 476 miles per gallon of fuel. Because greenhouse gas emissions are directly related to fuel consumption, moving freight by rail instead of truck reduces greenhouse gas emissions by 75%, on average. Highway gridlock costs the US economy \$121 billion per year in wasted fuel and time. Lost productivity, cargo delays, and other costs add tens of billions of dollars to this tab.

- U.S. Environmental Protection Agency (2013)

Transportation accounts for 27% of greenhouse gas emissions. Of that, medium- and heavy-duty trucks account for 22% and railways account for less than 6%. Medium- and heavy-duty trucks consume more than eight times the diesel fuel that railcars consume to move a ton of freight.

- Kenneally (1996)

Kansas City recognized that a significant part of the region's well-being depended in large part on its ability to reliably and efficiently move freight. To facilitate this movement and to ensure that Kansas City remained a vital transportation hub, local, regional, and state governments in 1994 launched a major study of the area's intermodal resources, bringing together various stakeholders to discuss intermodal freight strategies.

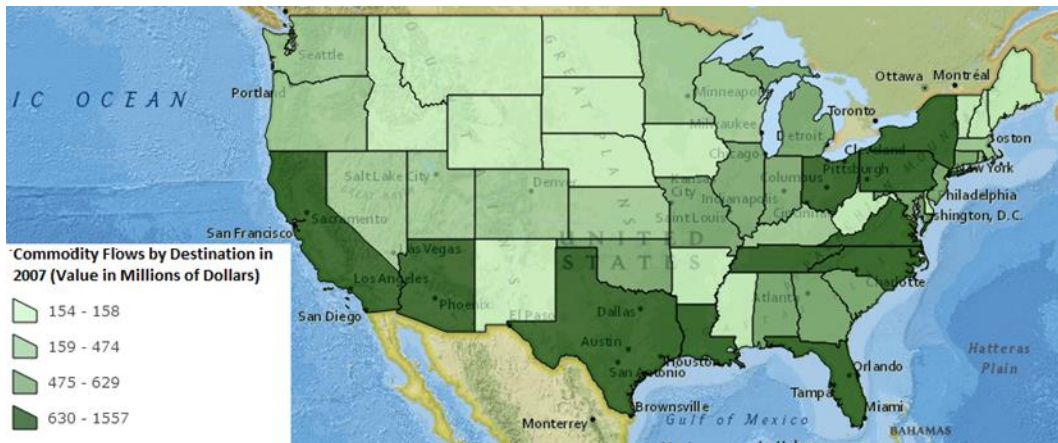
- Seedah et al. (2014)

Texas recognized increased freight demands from population growth and economic success, with little prospect of adding substantial capacity to the Texas Department of Transportation (TxDOT) principal highway networks. The research project examined the feasibility of utilizing railroads to offer competitive service and reduce truck volume on the highway networks.

Background

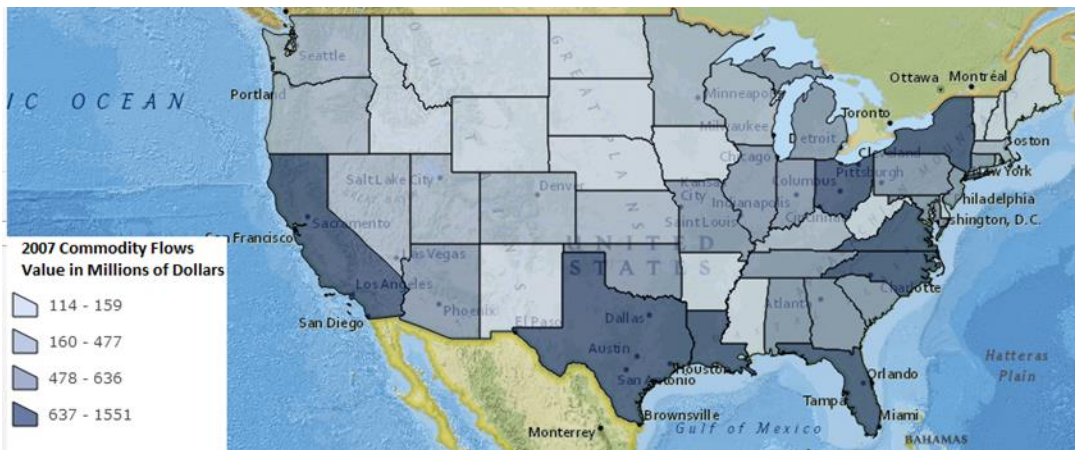
An intermodal terminal is a railroad facility designed for the loading and unloading of containers and trailers to and from flatcars for movement on the railroad and subsequent movement on the street or highway (Intermodal Association of North America 2013). For the purpose of this project, a centralized or common intermodal hub would work in a similar manner as a traditional, individual intermodal terminal but would encompass multiple railroad carriers that run their trains to a common location in order to capitalize on opportunities with various trucking carriers to transfer cargo across both short-haul and long-haul distances.

Similar to Kansas City, the economic well-being of the St. Louis region depends largely on its ability to utilize diverse transportation modes to move freight and goods between shippers and markets. Taking 2007 commodity flow data from ArcGIS online, the maps in Figure 1 and Figure 2 depict commodity flow traffic for Missouri in comparison to other states. Figure 1 shows that between \$487 million and \$636 million in commodity flows are directly transported through Missouri, and Figure 2 shows that between \$475 million and \$629 million in commodity value was destined for Missouri in 2007.



Map produced via <https://hub.arcgis.com/items/95dfbd108adb48668c6a811b3140b846> with source data obtained from Bureau of Transportation Statistics

Figure 1. Commodity flows transported to Missouri in 2007



Map produced via <https://hub.arcgis.com/items/95dfbd108adb48668c6a811b3140b846> with source data obtained from Bureau of Transportation Statistics

Figure 2. Commodity value destined for Missouri in 2007

The reason Missouri has more commodity flow compared to other Midwest states is partly because of its accessibility to waterway systems (Figure 3). St. Louis is located in an ideal location because it is near major waterways in the Mississippi River system, so it is able to take advantage of freight being carried on those waterways.



<https://kids.britannica.com/students/assembly/view/164961>
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Figure 3. Major waterways in the US

Table 1 shows data for waterway commerce, and despite the economic recession of the late-2000s, the Mississippi River system continues to show consistency in that a significant portion of cargo traffic travels down this waterway system. In addition, most US cities can be reached either the same day or within two days by most transportation modes from St. Louis, and this makes it an attractive area for shippers to use.

Table 1. Freight carried on major US waterways from 1990 to 2009, in millions of short tons

Waterway	1990	1995	2000	2005	2006	2007	2008	2009
Atlantic intracoastal waterway	4.2	3.5	3.1	2.7	2.6	2.5	2.9	2.5
Great Lakes	167.1	177.8	187.5	169.4	173.0	161.0	152.4	108.7
Gulf intracoastal waterway	115.4	118.0	113.8	116.1	122.6	125.1	115.9	108.1
Mississippi River system \ 1	659.1	707.2	715.5	678.0	702.1	699.0	681.6	622.1
Mississippi River main stem	475.3	520.3	515.6	464.6	497.7	500.5	486.8	447.7
Ohio River system \ 2	260.0	267.6	274.4	280.1	270.7	260.2	259.2	229.5
Columbia River	51.4	57.1	55.2	51.5	52.3	58.1	54.8	46.0
Snake River	4.8	6.8	6.7	5.3	5.2	5.4	3.7	4.4

Notes: 1 Main channels and the tributaries of the Mississippi, Illinois, Missouri, and Ohio rivers. 2 Main channels and the navigable tributaries and embayments of the Ohio, Tennessee, and Cumberland rivers.
Source: U.S. Army Corps of Engineers (2011)

Currently, there are four main railroad terminals in the St. Louis-Illinois region, which are operated by Burlington Northern Santa Fe (BNSF), CSX, Norfolk Southern, and Union Pacific (UP). See the map in Figure 4 for the location of these rail terminals in relation to St. Louis Lambert International Airport and major highways.

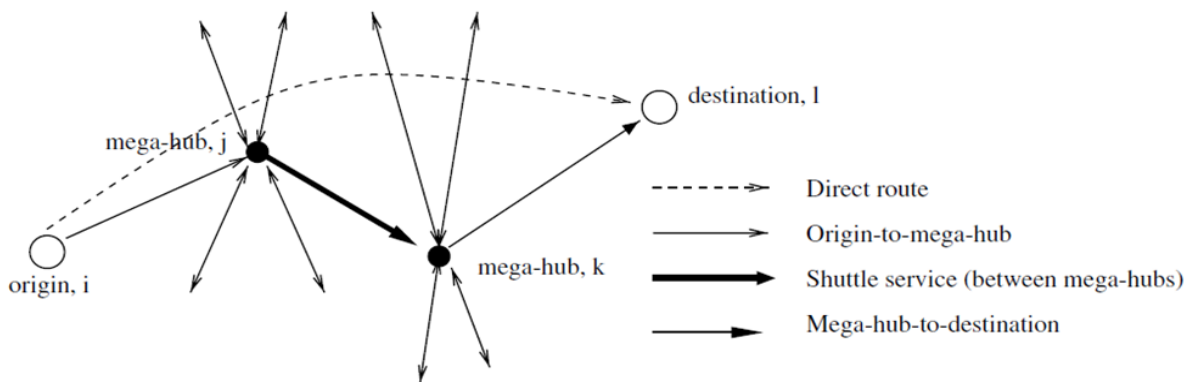


Figure 4. Four main railroad terminals in St. Louis

BENEFITS OF INTERMODAL HUB CONSTRUCTION

The primary environmental and economic argument for building a common intermodal hub in St. Louis is that its hub-and-spoke type of network design reduces the impact of heavy trucks on the road, which reduces congestion and transportation costs. In previous studies conducted on intermodal transportation, findings show that most shipment movements occur at night, thereby lessening delays during rush hours (Racunica and Wynter 2005).

A typical delivery not utilizing an intermodal hub results in many local transfers, which is known as drayage, and becomes very costly. For example, instead of moving a container from its origin to a warehouse and then to a rail terminal, the container would go directly from its origin to the intermodal hub. Consequently, the intermodal hub eliminates intermediary transference costs as well, which lowers transportation costs for both shippers and carriers. Such efficiencies help society in the long run due to lower prices that consumers pay for goods and less adverse health effects from pollution. Figure 5 shows that the hub-and-spoke design also allows for both direct and indirect origin and destination routes.



Racunica and Wynter 2005. © 2004 Elsevier Ltd. All rights reserved. Used with permission.

Figure 5. Direct versus hub-based itineraries for a typical origin-destination pair

For the overall intermodal shipment to be more efficient for full truckload transportation, many studies have found that the length of the linehaul must be long enough to offset the lower efficiency of drayage and increased energy consumption of the rail network, which differs with each trade lane (Groothedde et al. 2005). Groothedde et al. (2005) calculate that the CO₂ emission intensity per lane is found by dividing the total CO₂ emitted for the lane by the net ton miles of cargo shipped. On average, lane intensity is 70 grams of CO₂ per ton-mile, with a standard deviation of 13 grams CO₂ per ton-mile. The average truckload shipping intensity is 125 grams CO₂ per ton-mile (Groothedde et al. 2005).

According to the Association of American Railroads, railroads are four times more fuel efficient than trucks. In addition, moving freight by rail instead of truck reduces greenhouse gas emissions by 75% and reduces highway gridlock costs in the US economy by \$121 billion per year, which are directly attributed to waste in both fuel and time.

The hub-and-spoke design of rail intermodal hubs allows freight to be sorted and aggregated in the most efficient manner in order to reach full cargo-carrying capacity. Moreover, intermodal hubs are lightly regulated, which allows free markets to work with each other. It is common for rail carriers located within an intermodal hub to have contracts amongst themselves to carry another rail carrier’s cargo if market conditions demand it (Meng and Wang 2011). Therefore, intermodal hubs result in consolidating commodity flows so that economies of scale can be obtained (Groothedde et al. 2005).

In addition, intermodal hubs allow companies to mediate the effects caused by volatility in fuel prices by figuring out ways to transfer freight optimally without increasing transportation prices (Macharis et al. 2010). Similarly, intermodal hubs result in fixed service schedules, which further reduce variable costs. For instance, dedicated trade lanes, which are established to accommodate cargo that has a recurring volume to and from the same destinations, would be more feasible with aggregated freight at a large common intermodal terminal.

Currently, intermodal hubs are seen as a manifestation of technological progress, and they also attract economic development and market expansion from both industry and government leaders (Meng and Wang 2011). Most private rail companies will invest in the building of these hubs but ask governmental regulatory agencies to serve as the liaison in interstate commerce. A recent example is the success of CSX opening a large intermodal terminal in Toledo, OH.

While society benefits from these instrumental business partnerships, transportation development also carries a variety of external costs to society, some of which include accidents, noise, air pollution, climate change, and congestion (Macharis et al. 2010). One study compared the marginal external costs of transporting full and empty containers exclusively through road and rail transport and discovered that the development of an intermodal hub allows for optimal transportation solutions (Iannone 2012). Table 2 shows findings from a study by Fedele Iannone (2012) comparing the marginal external costs of transporting full and empty containers exclusively via road and railroad transportation.

Table 2. Marginal external costs of container transport, in cents

	Road transport		Rail transport	
	Full containers	Empty containers	Full containers	Empty containers
Greenhouse gases	0.037	0.005	0.012	0.0017
Air pollution	0.142	0.020	0.020	0.0029
Noise	0.108	0.015	0.067	0.0095
Accidents	0.021	0.003	0.002	0.0002
Congestion	0.264	0.037	0.000	0.0000
<i>Total</i>	0.572	0.081	0.101	0.014

Source: Iannone 2012

Cost Savings of a St. Louis Mega Intermodal Rail Center

The primary research question of this study included whether intercity drayage costs could be reduced based on the current location of major trucking and warehousing operations in St. Louis and their distance to rail terminals. Through geospatial research methodologies, it can be examined whether motor carriers in St. Louis would benefit from a common intermodal hub to reduce those intercity costs. The primary area of focus for this geospatial project was St. Louis County and St. Louis City, which are the areas inside the blue outline in Figure 6.

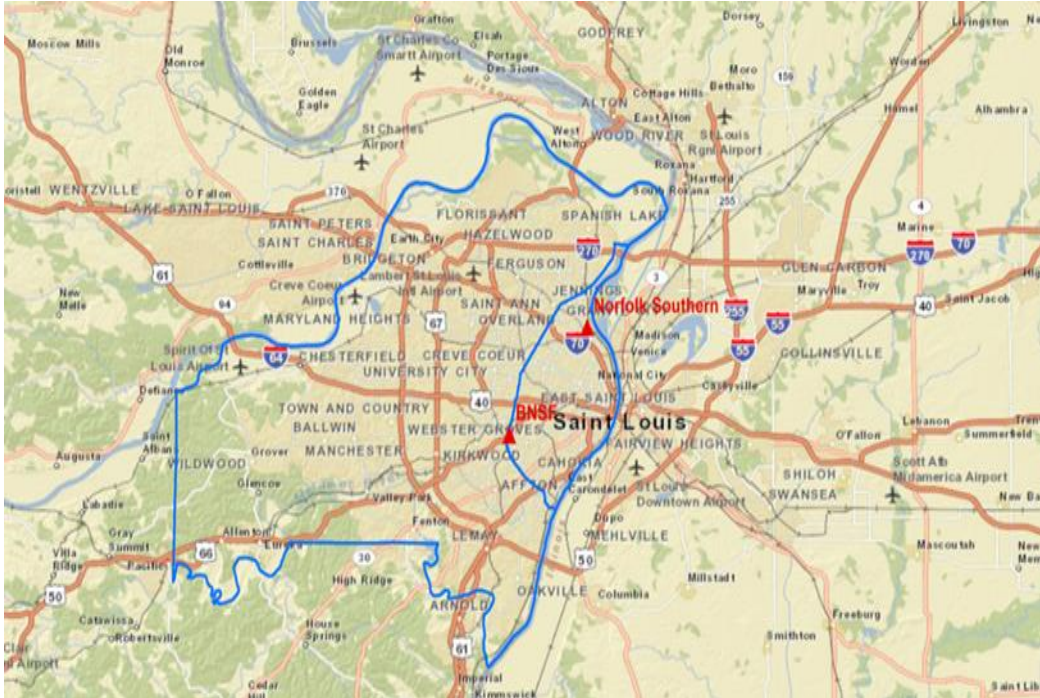


Figure 6. Primary areas of focus: St. Louis County and St. Louis City

The two current main rail terminals within those areas are BNSF and Norfolk Southern.

U.S. Census Bureau data for 2006 through 2011 provide the total number of transportation and warehousing establishments in Missouri, St. Louis County, and St. Louis City. The data takes into account the North American Industry Classification System (NAICS) codes that federal agencies use to classify business establishments for statistical reporting purposes, and for this report, it focused on the NAICS code beginning with 48, which represents the transportation and warehousing sector.

Table 3 shows that overall, from 2006 to 2011, there has been a reduction in transportation and warehousing establishments across Missouri, St. Louis County, and St. Louis City, which is most likely due to the recent recession.

Table 3. Transportation and warehousing establishments across Missouri, St. Louis County, and St. Louis City (2006–2011)

	Total establishments								
	2006 – Missouri overall	2011 – Missouri overall	% change in Missouri 2006– 2011	2006 St. Louis County	2011 St. Louis County	% change in St. Louis County 2006– 2011	2006 St. Louis City	2011 St. Louis County	% change in St. Louis City 2006– 2011
Transportation and warehousing: NAICS category 48	5,041	4,622	-8%	656	595	-9%	265	238	-10%
Truck transportation: NAICS 484	3,309	2,803	-15%	77	131	70%	58	17	-71%
Warehousing and storage: NAICS 493	305	303	-1%						

Source: U.S. Census Bureau 2014

Another change to note is that St. Louis County had a 70% gain in truck transportation establishments compared to a 71% loss of such establishments in St. Louis City, which indicates a shift of transportation providers relocating to St. Louis County.

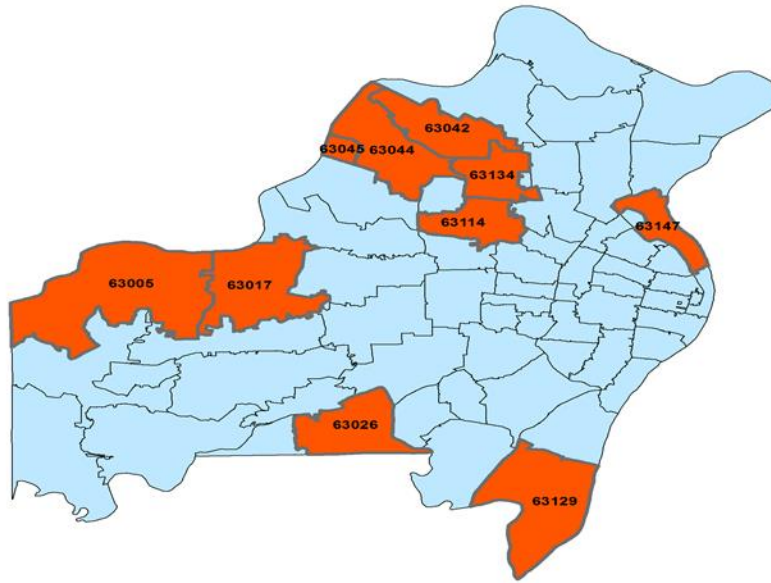
Table 4 shows the number of transportation establishments in St. Louis County and St. Louis City by the number of employees. Data on warehousing and storage establishments does not exist for St. Louis County and St. Louis City.

Table 4. Establishments by number of employees

Zip code	City description	Transportation and warehousing (48) total establishments 2011	Establishments by Number of Employees									County
			1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000 or more	
63042	Hazelwood/Robertson/Vigus	43	12	7	8	10	5	1	0	0	0	St. Louis County
63134	Berkeley/Edmondson/St. Louis/Woodson Terrace	43	18	8	9	3	3	2	0	0	0	St. Louis County
63147	St. Louis	43	12	5	5	8	6	6	1	0	0	St. Louis City
63044	Bridgeton/Bridgeton Terrace/Hazelwood	40	16	6	3	6	5	1	2	1	0	St. Louis County
63045	Bridgeton/Earth City/Hazelwood	34	7	7	4	8	2	4	1	0	1	St. Louis County
63129	Mehlville/Oakville/St. Louis	34	26	1	3	3	1	0	0	0	0	St. Louis County
63026	Fenton/Murphy	32	17	4	5	5	1	0	0	0	0	St. Louis County
63005	Chesterfield/Clarkson Valley/Gumbo/Wildwood	31	12	1	7	6	5	0	0	0	0	St. Louis County
63114	Breckenridge Hills/Charlack/Overland/Saint John/St. Louis/Vinita Park	28	13	7	4	1	1	1	1	0	0	St. Louis County
63017	Chesterfield/Clarkson Valley and Town and Country	22	15	1	2	3	0	1	0	0	0	St. Louis County

Source: U.S. Census Bureau 2014

Because the research project focuses on St. Louis City and St. Louis County, which make up the St. Louis region, 2011 U.S. Census Bureau data on business patterns by zip code were investigated to see if there were any major clusters of transportation and warehouse companies in specific areas. A total of 93 zip codes encompass St. Louis County and St. Louis City, and the transportation and warehousing establishments registered with the NAICS code of 48 were researched by region. The top 10 zip codes with the most trucking establishments are highlighted on orange in Figure 7.



U.S. Census Bureau 2014

Figure 7. Top 10 zip codes with the most trucking establishments

Nine out of the 10 zip codes located in the county collectively made up 52% of the St. Louis County transportation and warehouse establishments in 2011.

Graphically represented on the map of the target area as shown in Figure 7, 5 of these top 10 zip codes are adjacent to the St. Louis Lambert International Airport in the Bridgeton area. This area also is close to major highways, specifically Interstates 64 and 70. Figure 8 depicts, using hashed lines, the top 10 zip codes in the St. Louis region with the most transportation and logistics establishments in 2011.



Figure 8. Top 10 zip codes in the St. Louis region with the most transportation and logistics establishments in 2011

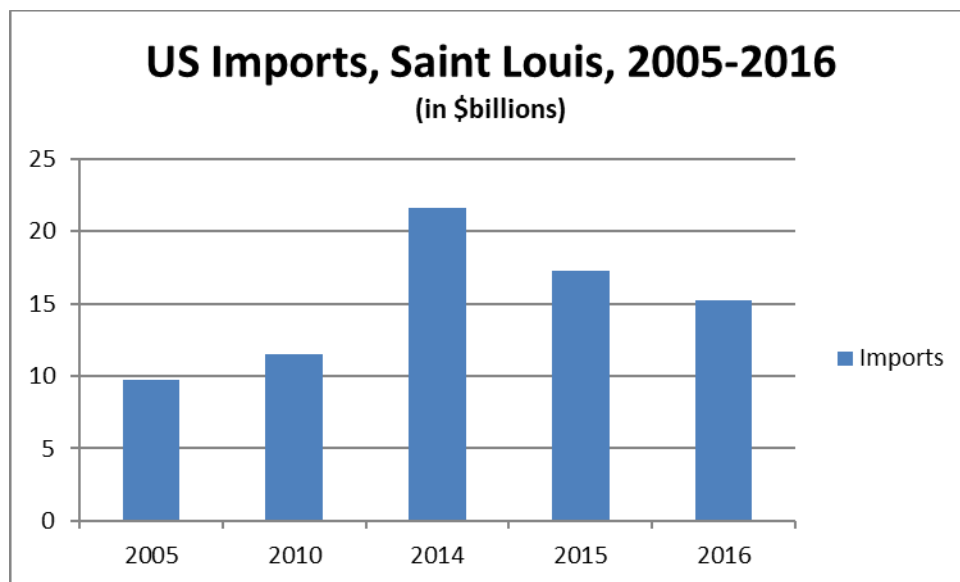
As shown on this map, there is a quite a bit of intercity distance between the two main rail terminals serving St. Louis and where the majority of these transportation providers are currently located. A centralized, common trucking and rail intermodal hub, if built near the zip codes with the most transportation and warehousing establishments, would promote efficiency through reducing truck short haul drayage costs. It would also result in environmental efficiency, alleviate highway traffic congestion in these areas, increase safety, decrease infrastructure deterioration, and ultimately decrease costs to the end intermodal costs and to consumers. However, there would be resistance to establishing a new, common intermodal rail terminal in St. Louis.

OPPOSITION TO COMMON INTERMODAL RAIL HUB IN ST. LOUIS

Opposition to the construction of an intermodal hub would come from several area interest groups. The business argument is that a convenient intermodal hub will take business away from the existing intermodal facilities that current rail officials feel are working just fine. In response to this critique, economists would argue that the hub promotes efficiency.

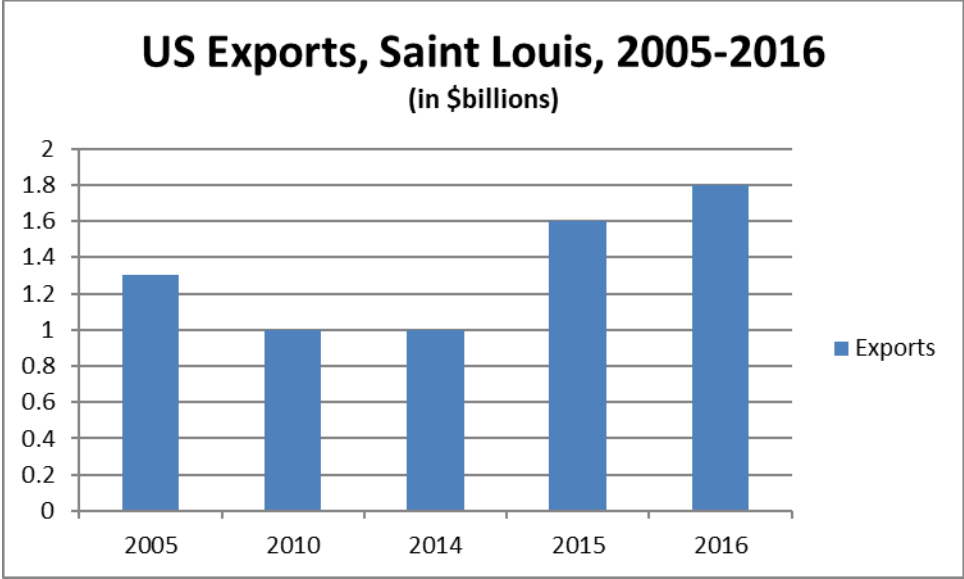
Another business argument would be what to do with existing rail terminals. Since most of these terminals have old infrastructure with limited capacity, the alternative of a less costly common terminal may be attractive. It should also be noted that the land currently occupied by existing intermodal facilities could be utilized for other development purposes or could be sold for significant amounts. By participating in a common terminal, these rail companies could lessen their capital and operating costs in much the same way as they do with a commonly owned city railway line that transfers cars among all the rail lines located in the city.

Opponents might also argue that an intermodal hub in St. Louis would not be able to compete successfully with the other surrounding Midwest intermodal hubs, primarily the nearby hubs in Kansas City, Missouri; Chicago, Illinois; and Toledo, Ohio. The graphs in Figure 9 and Figure 10, which are based on data of transportation flows in Missouri taken from the Statistical Abstract of the U.S., demonstrate that the St. Louis region is increasingly viable for intermodal trade because it has a significant amount of imports coming into the region. Finally, most of this import and export trade volume is moved as containerized cargo, which can also be transferred via intermodal transportation.



Source: U.S. Census Bureau 2017

Figure 9. Imports into St. Louis



Source: U.S. Census Bureau 2017

Figure 10. Exports out of St. Louis

CASE STUDIES OF INTERMODAL RAIL DEVELOPMENT

For this project, three case studies of nearby intermodal rail hub developments were conducted. The purpose of these case studies was to examine the asset utilization potential of intermodal facilities and identify lessons that could be applied to the construction of a rail mega intermodal hub in the St. Louis region for all rail carriers to jointly own and participate in. Individuals involved in governing intermodal organizations were interviewed for each of these case studies. The following individuals were interviewed:

- Chris J.F. Gutierrez, president of Kansas City SmartPort
- Matthew Dietrich, executive director of Ohio Rail Development Commission
- James R. Richardson, executive director of International Port of Memphis

Among all three case studies, the interviewees largely agreed that for intermodal hub construction, railroads must be present at the table, and partnerships between the public and private sectors are essential. Since intermodal construction is dependent on the railroads' infrastructure, if they don't have a vested interest in the project, it will not work. In regard to ownership of land, the interviewees concluded that large parcels of land in industrial parks must be sold rather than small parts being leased out.

Traditionally, most railroads will not work together in the same facility but do participate in joint ownership of railway terminals, so there is some grounds for cooperative intermodal rail facilities. However, interviewees suggested several times during the case studies that cities must set up a joint operation that forces cooperation among railroads within the metropolitan area in order to be successful. Consequently, partnerships between public and private sectors are essential to ensuring railroad cooperation. The public sector cannot create an intermodal facility just because it wants one. It must be economically attractive to the shippers via tax abatements or showing the economies of scale and attractiveness of proposed location.

The public sector acts as liaison between communities and industries. However, railroads must work to get partner companies on board. A crucial suggestion from these case studies was the need to create a separate economic entity to focus on freight-based economic development. Fortunately, this has already been done in the St. Louis region with the creation of St. Louis Regional Freightways, which develops public-private partnerships and provides the foundation for planning, marketing, and advocacy of the bi-state region as a national freight hub. Lastly, regarding the development of committees to study construction of these intermodal hubs, the case studies suggest that the committee overseeing intermodal development should be kept small.

Case Study # 1: Kansas City SmartPort

Kansas City has recently experienced phenomenal growth in imports and exports from the recent construction and expansion of logistics parks. Chris Gutierrez, president of SmartPort, was

interviewed to discuss the construction of the Kansas intermodal logistics parks and factors leading to their success.

Kansas City has always had an established rail infrastructure from the operations of UP, BNSF, Kansas City Southern and Norfolk Southern. What sets Kansas City apart is that it has two different types of facilities: intermodal facilities and intermodal logistics parks.

While the individual railroads maintain investments and commitments to the infrastructure of their intermodal facilities, the intermodal logistics parks help connect the intermodal facilities with the shippers so that their facilities can be located on site with the rail infrastructure. Currently in Kansas City, there are about five intermodal facilities and three intermodal logistics parks.

SmartPort is a unique organization that considers itself the virtual inland port that works with all of the local freight-based economic developments and projects. This entity is not tied to one park or one railroad. The railroads themselves came up with the idea to construct these logistics parks. Gutierrez explains, “There are a lot of examples of communities that want an intermodal facility, but those don’t come because you want them; they come because the railroad sees the operational efficiencies to have them. Intermodal efforts must be supported by the industry.”

The railroads’ involvement in creating a successful intermodal hub is critical. Prior to the construction of the recent intermodal logistics parks, SmartPort worked with the railroads on location choice and held public meetings and private sector leadership meetings with all local railroad companies about the plan, impact, and benefits and worked with the public sector groups to support designation, permitting and zoning, and other necessities. As a result, SmartPort is now very closely tied to both railroads and their real estate development partners attracting companies to locate there.

On the construction side of the logistics parks, the rail infrastructure itself is paid for by the railroads. The railroads sponsored a traffic study and hired engineering consultants and environmental impact consultants to construct an understanding of the impact of this project. They secured either outright acquisition of the land or the option to own development rights to the land. Each railroad company worked with SmartPort to select a real estate development partner and began pursuing the land they wanted. In both terminal location decisions, for BNSF and KCS, the railroads took control of the land first and then started the process of forecasting potential impacts.

SmartPort also worked with local communities to zone the logistics parks; facilitate development agreements; and determine the financial impact, job impact, and infrastructure needs around it. In the case of the BNSF logistics park, the land required annexation because it was within a county.

As these examples show, SmartPort assumes an advisor role, aligns itself with the shippers’ needs, and fosters comprehensive, social interest in disclosing optimal distribution, manufacturing, and employment opportunities and the prosperity of the potential venture.

SmartPort is charged with recruiting freight-based economic development. Distribution, warehousing, and manufacturing operations currently absent within its 18 counties are encouraged to locate on its site versus other cities. Through this strategy, SmartPort markets to two client bases. One is the shippers themselves through outreach marketing, event networking, and direct solicitation. The second base is what's called a site selection consultant. SmartPort recruits industry consultants who possess active partnerships with shipper/client hires, who in turn encourage clientele to choose a SmartPort facility.

Besides Gutierrez, at this time, there is one more employee working at SmartPort. Both are Kansas City Area Development Council (KCADC) employees assigned to SmartPort. SmartPort is a separate not-for-profit entity—separate board, separate financing—but is part of the KCADC team, specifically of the KCADC brand, to go after freight contracts.

Kansas City is one of the very few cities that has created a separate entity focused on economic freight development. Other cities mark these as initiatives, but responsibility usually falls to a local chamber of commerce or regional group. As a result, SmartPort is born and funded by the transportation industry, including all the railroads, all the trucking companies, third-party logistics businesses, and various other companies. Ninety percent of its budget comes from the private sector forging a consortium of transportation freight-oriented groups, in contrast to publicly run, regional chamber of commerce or economic development groups.

Transportation companies see this synergy. The more SmartPort brings in terms of development successes, the more efficient its processes, the more it keeps costs down. Traditional economic development groups have so far failed to act on the benefits private alignment with freight-based companies are accomplishing; rather they continue to enact antiquated labor force initiatives and incentives.

SmartPort was a concept that came out of a mid-1990s study that the Kansas City council of governments led and that led to earmark funding to analyze freight in the Kansas City market. That study measured how much freight comes in to Kansas City and examined subsequent commodity groups, transport modes, and destinations. The comprehensive freight study yielded a number of recommendations. One was the need for an entity's specific focus on this unique industry growing in Kansas City, which led to SmartPort's creation.

SmartPort was officially incorporated in 2000, and for 12 to 16 months, it struggled with the question: "What is it that SmartPort does?" The regional planning group did freight planning and infrastructure planning, and Kansas City had an economic development group and chamber of commerce, but what role should SmartPort play? It was not until the Kansas City Southern railroad invested its first check in SmartPort, and one of its team became chair of the board, that Smart Port molded itself around economic development of freight and securing freight projects. SmartPort initially didn't have any funding but rather had to strategize how it could sell itself as a brand to stakeholders and investors. In order to do that, SmartPort had to develop measurable metrics that it would be held accountable for, and thus it set out to raise funds to support initial operations.

Gutierrez says that the metrics and success of Smart Port is demonstrated by the focused effort of the organization to attract companies to locate in Kansas City versus competitor cities, specifically because of the private industry support of the SmartPort investor base. This advantage made the location of prospective freight projects in Kansas City more attractive. These freight projects produced some very early wins and illustrated how SmartPort was connected to them, which allowed SmartPort to rise rapidly within the industry.

SmartPort diligently secured congressional delegation support, and through both the commerce and transportation committees, received between \$8 million and \$9 million. A significant portion of the funding was used to develop a global transportation management system (TMS) solution for shippers to use when considering Kansas City as a potential manufacturing or warehousing facility. SmartPort has also made efforts to build consensus and project opportunities with Mexico, thereby extending the regional reach of Kansas City.

SmartPort looked at different locations for its intermodal port in Kansas City. There were concerns within the surrounding communities regarding construction of an intermodal port, specifically, increases in crime, congestion, and environmental impacts of diesel emissions. In tackling the potential environmental impacts of the emissions, both railroads invested resources to be environmentally friendly. In addition, all of the cranes used in the intermodal ports are electric with strict idling and diesel emission rules. Finally, the project put forth by BSNF is a state-of-the-art, green facility. Despite early concerns, both projects have proven to be a success for the communities they are in.

On the public sector side, the city signed a development agreement with the railroad and real estate developers to commit certain revenues back to the community. Most cities in the United States generally incentivize construction of these massive infrastructures by providing 50% property tax abatement for 10 years. For Everton, Missouri, the incentive was 75% property tax abatement for 10 years, but the net value to the company is 50%. The remaining 25% property tax abatement goes to development of infrastructure in the park, city permits, and city fees. These incentives are similar throughout rest of the country. Their municipal economic benefit comes from the other manufacturers and distribution centers that come to this location as a result of the local intermodal and logistics facilities.

For St. Louis, or any other city undertaking an intermodal hub project, there are several key points to consider. According to Gutierrez, railroads are the key drivers. Thus, they have to be committed in starting and completing the project. If railroads do not see the operational efficiencies or increase in productivity that an intermodal hub has to offer, the project will not succeed. A case in point: SmartPort tried to convince UP officials of the merits of constructing an intermodal hub in Kansas City. UP denied the proposal because it already had intermodal facilities in Salt Lake City, Utah, and Dallas, Texas. In addition, there wasn't a need for UP to expand into the existing Kansas City intermodal hub. Various communities have toyed with the idea of a consolidated rail infrastructure. Although seemingly ideal, officials within the railroad industry are resistant to these proposals.

In Missouri, imports are increasing but exports have not been expanding at the same rate. This can be improved. For example, SmartPort uses a variety of tactics besides incentives to encourage more companies to export from the Kansas City region. Similar to St. Louis, Kansas City has an active world trade center that is a lead group to work with the private sector in international trade. In addition, Kansas City is also home to state trade promotion offices, an international trade council, and a variety of organizations that are focused on the effort to grow trade the same as St. Louis.

Based on observations on the railroads working together in their intermodal switching, they tend to work well together with the terminal, but it is a forced cooperation. It's not forced in a regulatory sense. They know the benefits, but railroads traditionally don't work extremely well together. They are competitive, so it is natural for one to always want to have the expedited switching advantage over the other. It is a challenging cooperation, but Kansas City has performed well, despite being overseen by a separate, private entity while the line operations are maintained by the short line railroad. It is done well, but it is still a contentious discussion.

Currently, the transportation community in Kansas City is attempting to support an intermodal authority, which would give the city authority to make changes over the intermodal port. Such authority would assist the railroads in overcoming natural competitive tendencies.

Case Study # 2: Ohio Rail Development Commission

Ohio has 13 main intermodal facilities, all overseen by the Ohio Rail Development Commission (ORDC). Matthew Dietrich, executive director of the Ohio Rail Development Commission, was interviewed to provide insight into the success of these intermodal facilities and ORDC development. ORDC's mission is to plan, promote, and implement the improved movement of goods and people faster and safer on rail transportation. Statutory authority to conduct rail planning in Ohio is assigned to the ORDC, an independent agency of the Ohio Department of Transportation (ODOT). ORDC is the successor of the Ohio High Speed Rail Authority and the Division of Rail Transportation of ODOT.

ORDC administers grade crossing safety funds from federal highway funds. However, the rail commission doesn't fit neatly into the mold of a state transportation agency because the ORDC deals with private industries. That's changing now with the emergence of multiple public-private partnerships, but historically federal funds followed cradle-to-grave public infrastructure projects. ORDC deals with transportation but also deals with private entities on a deal-by-deal basis.

ORDC has one foot in the transportation world and one foot in the development world. Dietrich is an employee and officer of the commission, but his email has an ODOT domain. Every state entity is different. Currently, the rail commission works for the state of Ohio, as it has for 20 years. Other states accomplish substantially the same operations under the department of transportation or state port authority structure.

ORDC mainly focuses on capital infrastructure development rather than business development. As a state entity, ORDC has an Ohio Department of Transportation head and the state Development Services Agency director on the board. ORDC administers all of the federal highway grade crossing safety funds and provides direct assistance for freight projects in terms of loans, grants, and special projects. For the most part with the Class 1 railroads, everything ORDC does with the intermodals falls into its special projects.

According to Dietrich, of the 13 intermodal facilities, only one falls under the definition of an intermodal hub: a CSX facility located in northwest Ohio. This facility has instituted more of an airline-type system of using only intermodal containers. It's one of the few rail facilities that is designed for containers to sit on the ground. Dietrich said, "You can picture that as the O'Hare or the Atlanta of the intermodal container world." First, the trains' long-hauls to the facility. Then, the trains are blocked, and shuttles are used to transport the goods to nearby intermodal facilities. It was one of the nodes on the National Gateway, which are all single-owner facilities. According to Dietrich, it is unlikely that any of these nodes will be progressing to any type of a shared ownership facility.

In the northwest Ohio container port, although it is a CSX facility, one can see BNSF and Union Pacific trains running on those tracks. This is because BSNF and Union Pacific have an agreement with CSX to interchange in Chicago or pass through on their tracks. When ORDC first proposed Rickenbacker port as a general intermodal port, the railroad companies dismissed the proposal. However, after many discussions, the railroad companies came to an agreement.

Buckeye Yard existed as an intermodal yard that CSX inherited in the Conrail split. Maple Heights Yard was specifically Norfolk Southern-driven. Sharonville Yard had always been an intermodal yard, and Norfolk Southern made improvements to it. As a result, it has become more important to them with the development of Rickenbacker Yard.

The railroad companies brought proposals to the ORDC, and the ORDC provided tremendous help to the railroad companies in facilitating the development of those intermodal facilities. According to Dietrich, the ORDC analyzed the benefits of the proposal, i.e., fewer trucks on the road resulting in the lessening of deteriorating infrastructure and economic development around the intermodal yards and surrounding businesses were primary selling points.

Once the ORDC completed an analysis, and there was an agreement that construction of the intermodal port was mutually beneficial to railroad companies, and the state of Ohio, plans began to proceed to establish Rickenbacker as an intermodal hub. To get the process started, the ORDC collaborated with West Virginia and helped fund the initial study on types of bridge clearances that would be needed to provide the double-stacked route from the port of Norfolk to the Rickenbacker intermodal facility. Once the study was completed, the ORDC helped the railroads facilitate the discussions with the local development officials, state agencies, and the federal government in terms of building a coalition to support that project.

In addition, ORDC worked closely to achieve stakeholder participation and interest. For example, in the case of the North Baltimore (Ohio) terminal, an existing intermodal yard had

constrained capacity. ORDC met with the railroads' representatives, who were interested in getting more international freight into the Midwest. ORDC was not focusing specifically on the Norfolk Southern system but rather trying to decipher how ORDC could secure more intermodal containers into the Midwest and how it could replicate that success through the port of Virginia and the West Virginia port authority.

Therefore, ORDC partnered with Norfolk Southern and began examining the Norfolk Southern corridor to determine the ideal location for a double stack. This led to the established of the Norfolk Southern Heartland Corridor. Through this process, ORDC identified many benefits to a Midwest location and its high traffic volume. Dietrich explains, "You can't build your intermodal yards unless you have a double stack, but you can't justify double stacking until you have a destination to put it into that [also] has [adequate] capacity. In some ways these projects were separate, but you can't talk about one without mentioning the other. Our focus was on developing the double stack corridor and securing public funds for that." While ORDC focused on the corridor, Norfolk Southern focused on Rickenbacker Yard.

The airport authority (Rickenbacker was an old military base) concurrently worked on other capital improvements to enhance the intermodal yard: last-mile connections, development of their industrial park, development of overweight/size local roads, and development of blanket permits to transfer heavier trucks from container yards to the warehouses. The airport authority, which owns the industrial development area, and the port of Virginia, all have been collaborating in joint marketing efforts for the intermodal facility, in addition to the Norfolk Southern Railroad.

The ORDC's biggest contact in West Virginia was the state port authority during the construction of the Heartland Corridor. The executive director of the ORDC at the time took a lot of heat for supporting the Heartland Corridor because it was \$800,000 in impediments to double stack. All efforts were focused on it, and it was the Nick J. Rahall Institute at West Virginia's Marshall University that did the study for ORDC for the double stack clearances. Dietrich recalls that due to what appeared to be studying tunnels and bridges in West Virginia, the ORDC was criticized for spending Ohio taxpayer money in West Virginia; however, ORDC argues that those studies were an efficient use of the \$25,000 that was spent. That's how Rickenbacker developed. ORDC funded the study to find out what was needed and worked with the railroads to identify stakeholders. The Columbus Airport Authority led the project as the landowner of the future intermodal yard and worked with the railroad directly while the ORDC focused its attentions on the corridor.

The percentages of intermodal freight going through the state versus how much is destined to or originating in Ohio differ for each yard. ORDC ensured its analysis focuses on the economic development of the origin-destination pair, meaning the destination or origin is in Ohio. The ORDC recognizes that every intermodal train is 200 trucks that aren't traveling through the state on roadways. Aside from the freight destined for Ohio, the ORDC also sees opportunities in the state's geographic location, with a lot of "through" traffic with the I-75 and I-80 corridors. The ORDC's goal is to identify opportunities available to open the containers that would otherwise just pass through the state. While opening containers costs railroads money, they can employ

value-added alternatives to help recoup some of that money. That's been ORDC's strategy with intermodal.

When asked about the positive impacts of keeping trucks off the highway because of trains coming in from the Heartland Corridor, Dietrich said a lot of it depends on the business and economic development case, which is difficult to quantify. Despite an extensive working relationship with the General Accountability Office, as well as the U.S. Department of Transportation, ORDC has struggled to obtain proper metrics to measure the impact of the intermodal yards beyond tax and employment.

Two of the biggest proponent states of developing the corridor at that time were Pennsylvania and Ohio. Taking trucks off the state highways is a great goal but hard to quantify. Consequently, it was the financial impact of employment in the intermodal yard, and the economic development opportunity surrounding the yard that drove Ohio into leading the effort for Rickenbacker Yard. Alternatively, Pennsylvania chose to lead the development of an intermodal yard in Chambersburg Pa.

One of the lessons learned from the intermodal success is that the ORDC advocates for the railroads to initiate or validate the discussion for intermodal development. Because of their systems. They know where the customers are, and they know where the networks are. However, local communities might be able to bring them opportunities that they might not otherwise know about.

This is what happened in Toledo, Ohio with the development of Norfolk Sothern's Airline Yard. The community approached the railroad claiming the existing railroad yard was underutilized. This led to the development of a consortium of community leaders and shippers along with the railroad. Improvements and further development of the yard into an intermodal terminal yard was successful in generating significantly more freight moving through this yard.

For metrics to measure the success of these intermodal facilities, especially with the National Gateway, the ORDC looked at usage of those facilities. What kind of capacity is there? What's the delta between how many containers a railroad is running between single stack versus double stack? Are the intermodal facilities recognizing the utilization rates that they thought they would? For the success of the intermodal yards, the ORDC will look at companies served in Ohio. ORDC will ask the railroads to identify the companies served and get them on board and will use that as a proxy.

Dietrich mentioned that it's important for these companies that are served to get on board, yet, depending on the project, sometimes the railroad fails to cooperate or support the initiative. In the case of northwest Ohio and the huge international gateway project, CSX took those on itself with the help of the local economic development entity. Alternatively, in the case of Rickenbacker, located in center of the state, Columbus, the owner of the neighboring industrial park, the Airport Authority, began marketing the property with partnerships with the developers. Dietrich explains, the "ORDC [has] two minds. It's us having the transportation side saying we've built this. What does it do to the road network?" The road network has been the focus of

its analyses. ORDC collects data from the railroads' economic development analysis and relies on state partners to validate the data, even though it does not factor in all indirect costs, such as when trucks are off the road and the wear and tear on vehicles.

For the most part, motor carriers have been supportive. The rail carriers themselves have certain relationships. Marion Intermodal Center, a private intermodal center that CSX serves, was driven by Schneider Trucking. It was hook and haul for the railroads, and it was a direct boutique rail center for Schneider. JB Hunt has a huge presence in Rickenbacker. CSX has its own trucking firms it works with, and Norfolk Southern has its own. When the contracts are up, all that changes. ORDC ensures that contract negotiations for any project include a big-picture focus and consider public, economic, and transportation benefits.

Dietrich was also asked if anyone in the Ohio revenue department criticized the ORDC for removing trucks off the highway and, with them, lost fuel tax revenue. Surprisingly, Dietrich mentions that no one has criticized the ORDC for this issue. Ohio has been going through tax reform and modernizing its tax code, so it's been challenging to figure out.

Given what St. Louis is trying to do, Dietrich advised, "You can bring opportunities to the railroads, but they need to validate it. At some points, the railroad needs to lead the effort; otherwise, they just don't have the vested interest to make it happen."

Case Study # 3: International Port of Memphis

The International Port of Memphis is a major industrial port centrally located in North America. The Memphis and Shelby County Port Commission manages the 15,000 acres of property in southwest Memphis, Tennessee, along the Mississippi River that make up the international port, with a focus on industrial, commercial, and environmental development. James R. Richardson, executive director of International Port of Memphis, was interviewed to learn more about the success of Memphis in intermodal development.

According to the about section of its website, The International Port of Memphis is the second largest inland port on the shallow draft portion of the Mississippi River and the fourth largest inland port in the United States. The International Port of Memphis covers the Tennessee and Arkansas sides of the Mississippi River from river mile 725 to mile 740. Within this 15-mile reach, there are 68 water-fronted facilities, 37 of which are terminal facilities moving products such as petroleum, tar, asphalt, cement, steel, coal, salt, fertilizers, rock and gravel, and, of course, grains. The International Port of Memphis is 400 river miles from St. Louis and 600 river miles from New Orleans and is ice-free year-round.

The jurisdictional and statistical boundaries of the International Port of Memphis include the McKeller Lake/President's Island complex, the West Memphis Harbor, the Rivergate Harbor, the Wolf River Harbor downtown, and Fullen dock and harbor north of downtown. At present, 95% of the industries that are in the International Port of Memphis are located on President's Island. Inland ports are different than deep water ports because the deep water ports control all their

facilities. The railroads in their facilities are also partners. The railroads and ports in the inland ports are separate from each other, particularly when it relates to intermodal facilities. The Mississippi and Ohio Rivers currently have no container-on-barge movements. And, officials there indicate this will probably remain the case for the near future.

There are five Class 1 railroads coming into Memphis. Prior to the evolution of significant intermodal freight, most rail yards were rail freight yards with little space for trucks. Memphis had many rail yards that were in urban areas surrounded by residential places. When containerization became a big item in the 1980s and 1990s, Memphis shippers were running container trucks through neighborhoods in large quantities. Previously, there had been only freight cars, and there was no additional traffic to the neighborhood because it was all rail. Thus, intermodal container traffic became a major concern to Memphis officials.

Memphis railroads started talking about moving their yard to build a larger intermodal facility. The first major rail carrier to initiate a move was UP. They were talking about moving their new facility to Marion, Arkansas, on the other side of the river. That got the attention of several people at the local chamber of commerce, the City of Memphis, and Shelby County, worrying that the next major industry movement among rail yards could be moving to larger, peripheral locations that can be expanded without impacting neighborhoods. The idea was not to move the freight yards but to move containers out of the freight yards and decrease traffic to allow for room to grow.

The city and the chamber of commerce formed what was called the Super Terminal Committee, tasked with trying to bring all of the Class 1 railroads together in a single location for optimal service. At the time, the only option in Memphis of adequate size was a property just south of Memphis called the Frank C. Pidgeon Industrial Park. Memphis started a \$1.2 million process trying to convince all five local railroads companies to funnel their individual railroad terminals into one strategic location. It became an arduous task due to independent operation issues.

Nevertheless, after the discussions, UP still decided to go across the river to Marion. However, the community, the port commission board, and the city and county administrations influenced most of the railroads to build their new intermodal facilities in or near the Memphis metropolitan area. BNSF stayed where it was, near Memphis, but with the help of the state, it acquired additional land and built a new intermodal facility. Norfolk Southern went out east of Memphis with its east lines, which terminate in Memphis. However, the International Port of Memphis, ultimately successfully, reached an agreement with Canadian National (CN) and CSX to build a joint facility in the Memphis industrial park, now called the Gateway Memphis Intermodal Facility. That process consumed six to seven years to complete.

The industrial park is a levee-protected system with 5,500 acres within the levee that ties into a bluff. Inside that area is about 3,500 to 4,000 developable acres. Memphis got a designated industrial road into the park in the 1990s. The city and state spent \$35 million to build the road on top of the levee, which is now a designated corridor to allow access to the park. Part of the local funds were used as an incentive for Birmingham Steel to construct a mill on the property, which is now a special quality steel plant operated by Nucor Steel. Since then, business has

grown exponentially. The surrounding areas are now home to large facilities, including a disposal facility and an intermodal yard for CSX and CN, with plans to expand and build warehousing and distribution facilities over the next decade. The park is at capacity with clientele.

The biggest issues for the railroads in a study the port conducted was travel times and consistency for the railroads. That is, how much time and what was the reliability of this time in getting from their main lines to proposed facility locations. This issue seemed to be equally as important as operational control, because whenever a railroad had to switch to a competitor's railroad lines, it became subservient to the needs of that railroad's owner. This led to significant idle time and late shipments.

The International Port of Memphis determined that the forced cooperation between railroad companies causes both management issues and operational issues among the industry and within the intermodal port. Therefore, the Gateway Memphis Intermodal Facility has separate gates for CSX and CN, a shared operator, and no shared data.

Despite state competition, Memphis does try to work jointly with stakeholders in Arkansas; however, difficulties arise due to the proximity of the Mississippi River, which also acts as a jurisdictional dividing line between federal agencies, like the U.S. Fish and Wildlife Service. Development is driven by state governments and local communities that all compete for federal funding.

The first lesson the International Port of Memphis learned in building intermodal facilities is to keep the committee overseeing the project small. The International Port of Memphis ended up having seven or eight committee members. It recommends maintaining a small committee to minimize resistance to progress. Consequently, the second lesson is to make sure that the people on the committee are key players and not just figureheads.

PROPOSED LOCATION FROM A CARRIER POINT OF VIEW

As shown by the examples above and the current locations of both shippers and existing railroad facilities, the St. Louis region is a highly likely candidate to benefit greatly from a consolidated mega intermodal terminal with ease of access and shared intermodal facility costs. Fortunately, the Terminal Railroad Association of St. Louis (TRRA) has been closely involved in overseeing railroad operations in the St. Louis metropolitan area. As a result, the TRRA is one of the proponents in the region that has looked at building a major rail and trucking intermodal hub.

After considering geographic locations of shippers and rail facilities mentioned earlier in this report, it is proposed that the area highlighted in green in the center circle of Figure 11, where Norfolk Southern, UP, and BNSF merge, is one of the best-proposed sites for development of a mega intermodal hub. It is close to existing port facilities, as well as a major distribution center to the north of it.



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Figure 11. Area where Norfolk Southern, UP, and BNSF merge together

While considerations of land availability and incentives would obviously require further study, the supporting rationale for a mega intermodal rail terminal for St. Louis is supported by the observations gained through the above case studies.

CONCLUSION

In conclusion, based on economic and environmental arguments to reduce intercity transfer costs, which are supported by geospatial analysis, there is a need for the construction of an intermodal hub in St. Louis that will promote efficient transportation development and minimize cost for trucking carriers. Looking through both a macroeconomic and microeconomic lens, the economic arguments suggest that intermodal hub development in the St. Louis region reduces carbon emissions, creates positive externalities, maximizes net benefits, and leads to technological progress. There are limited alternatives to the hub, and none of these provides the optimal tradeoff. Overall, the opportunity cost to current and future generations is too high to not pursue the construction of a rail and trucking intermodal hub in the St. Louis region.

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