

ENCOURAGING DEVELOPMENT OF INTERMODAL FREIGHT FACILITIES

INTRODUCTION

“Intermodal facilities are sites where freight is conveyed from one mode of freight transportation to another. Examples include water/port to rail or highway movements, and truck/rail interfaces.” Intermodal freight operations involve highway, rail, water, and air and create opportunities to take advantage of the efficiencies and technological advances that can allow the different modes to work in tandem. (1) The attention given to intermodalism since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 has grown in the ensuing years. Federal, state, and private sector initiatives have expanded the availability of intermodal freight terminals. Under the most recent federal transportation bill, SAFETEA-LU, research and development of intermodal facilities continues to be encouraged.

In recent years, increasing volumes of freight, growing passenger travel, and an increasing emphasis on security have strained the efficiency of freight transportation in many locations, particularly at gateways and along major transportation corridors. Between 1990 and 2003, U.S. international trade with Canada and Mexico, our top two trading partners, rose by approximately 91 percent, due in part to the creation of North American Free Trade Agreement (NAFTA) in 1994. (2)

Intermodality in freight transport can accomplish several important things in states struggling to manage highway capacity issues in the face of ever-increasing demands on the existing transportation system. In particular the strategic use of rail transport along corridors where freight shipment on highways has become congested can take pressure off the highway system. In addition, environmental benefits can accrue by diminishing the perceived need to expand the highway system through better-utilizing existing transportation infrastructure. This paper will explore intermodal shipping options, including the capacity-building potential of intermodal freight, as well as environmental, policy, and technology considerations.

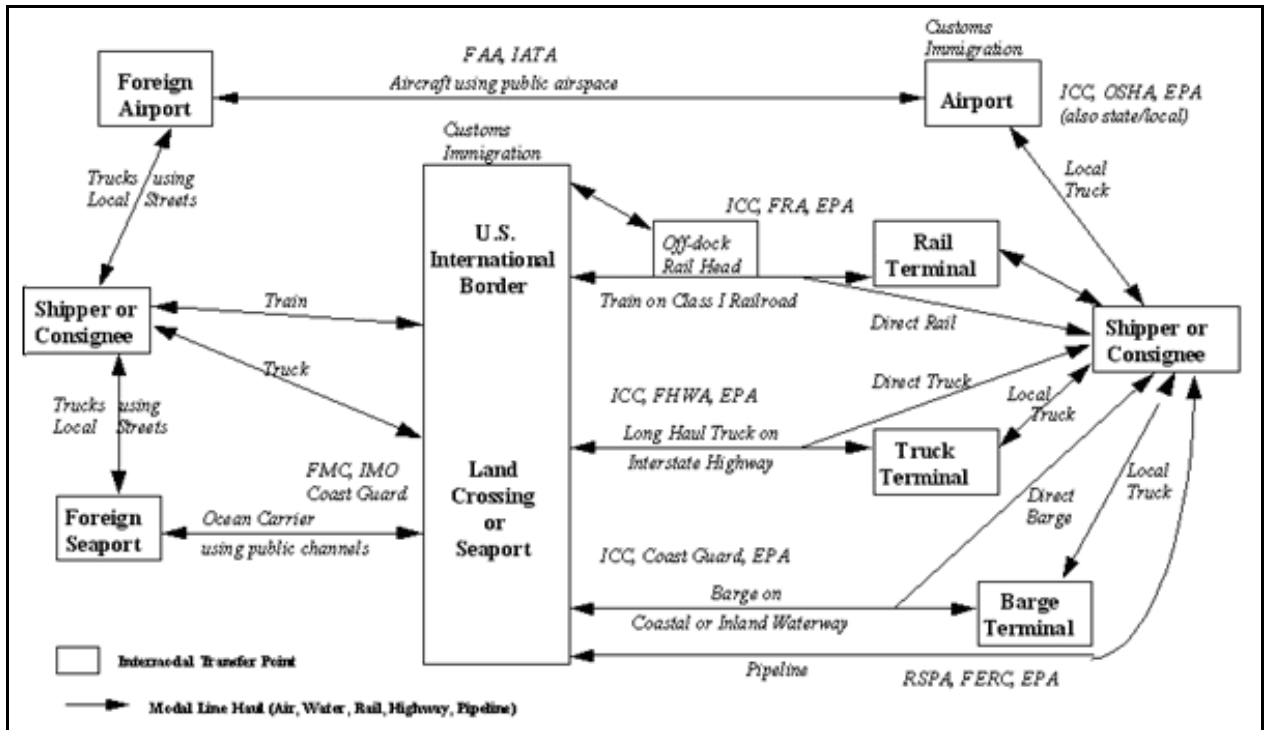


Figure 1: An Overview of the International Freight Transportation System
 Source: http://ops.fhwa.dot.gov/freight/intermodal/trends/trends_2.htm

AVAILABLE PROGRAMS

A variety of programs to facilitate the development of an intermodal freight shipping program exist. The FHWA has a department dedicated to studying and encouraging the development of intermodal freight infrastructure country-wide. The FHWA has also done significant research into the possibilities of expanding the country’s capabilities in this type of shipping, particularly in the international arena (see Figure 1). Brief descriptions of the primary programs currently in place to help develop intermodal freight infrastructure are presented below. Most of the programs are included in the SAFETEA-LU legislation.

Intermodal Freight Technology Program

This program is independent of the SAFETEA-LU legislation and represents an ongoing federal effort to promote the development of a fully-functional intermodal freight network. The Upper Midwest Freight stakeholders can take advantage of this research when working to improve its regional intermodal freight system.

According to the FHWA (3), The Office of Freight Management and Operations promotes the deployment of technology and the adoption of best practices to facilitate the smooth flow of goods on the Nation's transportation system and across our borders. The Intermodal Freight Technology program conducts

operational tests of Intelligent Transportation Systems (ITS) technologies, supports the development of tools to evaluate infrastructure and operational needs at border crossings, and works with our partners to develop standards for exchanging electronic freight data.

Programs in SAFETEA-LU

These initiatives provide opportunities for the Upper Midwest states to develop their intermodal freight shipping capabilities, thereby capitalizing on the existing network of highway, rail, waterway, and air transportation in place in the region. SAFETEA-LU programs designed to improve intermodal connectivity include (4):

- **The Freight Intermodal Distribution Pilot Program (§1306)** provides grants to facilitate intermodal freight transportation initiatives at the state and local level to relieve congestion and improve safety, and to provide capital funding to address infrastructure and freight distribution needs at inland ports and intermodal freight facilities. The Act names six projects, funded at \$5 million each. For each year through 2009, each of the six designated projects is to receive 20% of its funding (\$1 million each). Projects for this funding cycle are located in the south or on the west coast. The fact that there are no projects scheduled for the Upper Midwest is a missed opportunity. Freight stakeholders in the Upper Midwest need to seriously consider taking advantage of this opportunity in the next round of funding decisions in order to increase the capacity and efficiency of intermodal freight opportunities in the region.
- **Transportation Infrastructure Finance and Innovation Act (TIFIA) (§1601)**-- The TIFIA program provides Federal credit assistance to nationally or regionally significant surface transportation projects, including highway, transit and rail.
- **National Highway System [§6006]:** The National Highway System (NHS) also provides support for the development and maintenance of intermodal freight facilities, particularly for highways that provide motor vehicle access between the NHS and the intermodal facilities. The system includes the interstate system and significant rural and urban roads serving major population centers, international border crossings, highways that provide motor vehicle access between the NHS and major intermodal transportation facilities, and major travel destinations.

CURRENT ROLE OF INTERMODAL FREIGHT SHIPPING

Currently intermodal shipping is gaining favor as a way to more effectively use existing infrastructure. Utilizing available modes of transportation not only eases highway congestion, but better takes advantage of available transportation assets, such as rail, air, and water shipping. Table 1 highlights the types of freight generally shipped on the different modes and helps identify their strengths. In order to use these modes optimally, existing infrastructure needs to be maintained, and in some cases, expanded.

Table 1: Commodity Types per Transportation Mode

Mode	Commodity Types
Air	Perishables, High Value
Highway	Perishables, High Value, Trailer/Container, Dry Bulk, Liquid Bulk, HazMat, Other
Rail	Trailer/Container, Dry Bulk, Liquid Bulk, HazMat, Other
Maritime	IM Container, Dry Bulk, Liquid Bulk, Other
Inland Waterway	Dry Bulk, Liquid Bulk

Source: FHWA Office of Freight Management and Operations. January 2001. Review of Environmental Factors Affecting Intermodal Freight Transportation Facility Development and Expansion.

Terminals are the hub of activity in an intermodal freight system. They are the locations where freight is transferred from one mode of transport, say highway, to another mode, such as rail or water. Activity at the terminal is intensive and key to achieving the desired level of service and time efficiencies. It is important to remain aware of maintenance and infrastructure issues at these terminals. Basic



Figure 2: Containers in Shipping Yard

Source:

http://ops.fhwa.dot.gov/freight/intermodal/ift_overview.htm

considerations such as pavement condition ratings and wear and tear on equipment used to transfer loads cannot be overlooked without sacrificing quality of service.

The impact of containerization on easing the transfer between modes has provided benefits to efficiencies at the terminal. Transferring freight loaded in containers is far less labor intensive than the traditional method of packing in smaller pallets. Additionally containers hold more and provide more protection for the product being shipped.

Table 2: Breakdown of Freight Shipments with One or Both Trip-Ends in the Study Area

	Freight Tons %			Freight Value %			Freight Ton-Mile %		
	IS	Reg	Ext	IS	Reg	Ext	IS	Reg	Ext
<i>Total</i>	<i>70.3</i>	<i>13.5</i>	<i>16.2</i>	<i>39.6</i>	<i>23.4</i>	<i>36.9</i>	<i>15.0</i>	<i>17.0</i>	<i>68.0</i>
Truck	64.3	10.4	9.2	38.4	21.9	30.3	12.2	11.9	29.5
Rail	5.1	2.4	4.4	1.0	1.1	4.0	2.2	3.9	22.1
Truck and Rail	0.0	0.0	0.2	0.0	0.0	1.4	0.0	0.0	2.1
Air	0.0	0.0	0.0	0.1	0.4	0.7	0.0	0.0	0.1
Water	0.9	0.7	2.4	0.1	0.0	0.5	0.6	1.2	14.2

IS=Intrastate; Reg=Regional; Ext=External; Total does not include all modes, only the five major modes specified in the table.

Source: Upper Midwest Freight Corridor Study, Executive Summary, 2005.

Within the study, area intermodal transport, primarily truck and rail combination, is used primarily for long-distance shipping. Table 2 shows the distribution of freight shipments within the study area by mode. These different modes generally serve specific markets. For instance, much of the freight moved by water is low-value bulk commodities such as coal or gravel between the Upper Midwest and Louisiana ports. Intermodal does compete with truck and air transport for certain high-value goods, such as electronics, automobile parts, and machinery. California is an important origin and destination point for these products. (5)

The Upper Midwest is well positioned to be a major player in the shipping of intermodal freight. Five out of the ten largest freight-rail traffic generators are located in the study area, which aids in the shipment of high value goods using intermodal (truck/rail) facilities. California is the most important destination for intermodal freight shipments originating in the Upper Midwest. (5)

CREATING EFFICIENCIES AND REAPING ENVIRONMENTAL BENEFITS

Opportunities to develop a fully operational intermodal network in the Upper Midwest are available through existing federal programs that encourage the development of intermodal freight capacity. In addition, many in the transportation industry support improvements to intermodal freight facilities. This support is due to the potential efficiency of intermodal systems as we reach the limits of our highway infrastructure capacity.

Some questions related to intermodal facility construction and the implementation of intermodal strategies are important to ask, however. Do intermodal freight facilities and strategies have the potential to both increase overall capacity for freight hauling? What are the environmental impacts, positive and negative, of constructing intermodal facilities?

Expanding or constructing new intermodal facilities can provide benefits to the environment. Intermodal facilities, because they can reduce highway congestion and therefore motor vehicle emissions, and can improve air quality. Additionally, intermodal terminals have been sited on brown fields. Locating terminals on this type of property can minimize or eliminate negative environmental impacts. This being said, an environmental review of proposed intermodal transportation projects often is required.

Environmental Concerns by Type of Intermodal Facilities (6)

Environmental considerations often become a concern when planning the construction of a new transportation facility. A detailed analysis of potential environmental impacts is often necessary to identify the scope of the potential impacts. This is particularly true if federal or state monies/permits are involved in the planned project. Projects using federal, and in some cases state, funding are regulated under the National Environmental Policy Act (NEPA). Federal environmental laws oversee the protection and the mitigation of environmental impacts of a wide variety of resources, including:

- Noise/Vibration;
- Land Use;
- Socio-Economic;
- Air Quality;
- Water Quality;
- Hazardous Waste Contamination;
- Natural Resources, and;
- Cultural Resources.

Facility Types and Environmental Review (6)

Airports: Generally, airports are publicly owned. The FAA has authority to approve construction on airport property. This level of federal oversight at an airport freight facility construction site could trigger the NEPA process.

Ports: Army Corps of Engineers permitting requirements and expenditures of the Harbor Maintenance Tax for capital improvements frequently involve NEPA review in the form of Environmental Impact Statements (EIS) and Environmental Assessments (EA). FHWA becomes involved with port improvements through land-side projects including: new access into and out of ports via federal-aid highways, rail/highway grade separations at ports, and installation of ITS technology to improve the efficiency of port-highway interfaces.

Rail/Highway: Railroad facilities are often owned by privately-held railroads and are not as likely to require federal permits and funding, and in the past have not tended to trigger NEPA reviews. Federal-aid funding is available through several FHWA programs for rail/highway terminal improvements. These include: highway access to and from rail yards, reconstruction and building of National Highway System (NHS) intermodal freight connectors, improved interstate access, double stack compatibility for trains, highway/rail grade separation projects at rail yards and along rail lines, improvements to rail facilities, and grade crossing improvements, and activities that provide air quality benefits in non-attainment areas (diversion from truck to rail and other types of projects). These projects can require a variety of NEPA documents including a Categorical Exclusion (CE), an EA or an EIS.



Figure 3: Water Borne Freight Shipping

Source:

http://ops.fhwa.dot.gov/freight/intermodal/ift_oveview.htm

INTERMODAL TECHNOLOGY

Intermodal freight is constantly being moved within the country and internationally. Tracking of a shipment becomes difficult, because a container can transfer through shipping points several times before it reaches its destination. Asset tracking can enhance the surveillance and security of the container. This tool coordinates telecommunications technologies,

sensors, and simple bar codes and labels. These applications ensure shipments are moved from start to end safely and securely. For example, a container may be shipped from a plant on a flatbed truck and then loaded onto a rail car, and then back onto a truck for the final leg of its journey. The tracking device on the container would allow shippers to follow the progress of a shipment and ensure

there was no tampering of the shipment. These devices are very important for material handling and anti-theft, which protects the public from threats such as shipments of contraband or potential terrorist weaponry. (7)

Security of a shipment is another problem. To reduce the possibility of the cargo inside the containers being tampered with during shipment, electronic transponders are used as tags on the container doors. These track the container's route and ensure the security of the cargo. For example, E-Seals are disposable Radio Frequency Identification (RFID) transponders. It transmits the container's ID number to a reader within an inspection station. If the container has been opened or tampered with, a message will appear on the reader. When a container has left the country, this information is posted on the internet for tracking purposes. This application can increase efficiency and security at border crossings. (7) These technologies improve security of freight and help promote intermodal shipping.

As the US continues to grow and use intermodal shipping, there is a need to maintain shipping integrity and forecast traffic for planning purposes. US DOT is developing planning models to aid in stimulating activity in the intermodal-shipping industry. These models are important to the government and to shippers and can be useful to the Upper Midwest region when planning intermodal facilities. These models can simulate border crossings. A program called Border Wizard is a model that identifies and tests possible cross-border movements of vehicles and pedestrians. It was originally developed by the General Services Administration, US Customs, and other federal inspection agencies to identify infrastructure and operational needs at the borders. Today, it is deployed at 57 US ports of entry. The US DOT is considering using Border Wizard as a transportation-planning tool. Internationally, Canada is installing the system at the Detroit-Windsor crossing, and Mexico is interested in using the model. (2)

BENEFITS OF INTERMODAL FREIGHT SHIPPING

By using more than one mode of transportation, many opportunities become available for shippers and private stakeholders. However, with the help of new and increased technology, containers can be tracked throughout their routes and can indicate shipment problems. (7) This significant increase in security promotes the intermodal shipping industry and ensures businesses that their goods will be shipped without problems or delays.

Network efficiency is another benefit of intermodal shipping. To increase efficiency, there are many strategies that can be applied or are already in place. Enhancing schedules and routing of freight can create a significant decrease in freight vehicle mileage and increase load factors that will save time and money.

(7) With the continuing desire and need to find ways to ship goods faster, time efficiency is extremely important to companies shipping goods and to the shippers. Network efficiency makes a difference to not only the company selling the goods, but to the consumer, who is looking for products to be at their fingertips at all times.

Obtaining successful ways to reduce congestion is encouraged because congestion is a concern to freight shippers. With the help of intermodalism, larger shipments that need to travel longer distances can be moved from trucks to rail or water where possible to reduce congestion on roadways. Additionally, this increases safety to pedestrians, bicyclists, and motorists along the roadways. (8) Intermodal transport can improve community quality of life if fewer trucks are on the roadways. Trucks create large amounts of noise and air pollution, which makes neighborhoods unpleasant to live in. Overall, there is a cost savings as well, because it is cheaper to ship by rail or water than by truck.

Intermodalism can encourage shippers to use the mode with the lowest cost possible. Usually these modes are rail and water. They are more energy efficient, which promotes a healthier environment for everyone. Intermodalism is geared to obtain the optimum yield in the country's transportation resources. (2) Businesses are able to ship goods at lower costs because of the efficiency of the system. Then businesses are able to compete in the global market, which expands the country's opportunities for economic growth.

BARRIERS TO INTERMODALISM

Intermodalism appears attractive, but in reality it has its fair share of concerns. Congestion is at the top of the list. As stated above, there are many ways to reduce congestion, but it still remains a problem. It lessens reliability and performance of shippers. Congestion has the domino affect, because it then affects businesses, which in turn affects the consumer getting the goods that they need and want. The US economy runs on a very tight schedule to design, make, ship, and sell goods. Having on time shipments keeps the economy going. Congestion will continue to be a problem into the future, because the freight shipping industry is expected to grow substantially in the upcoming years. (2)

Information sharing is difficult to accomplish effectively and is another concern. There is a gap in the system of sharing information. This creates inefficiencies and concerns about security and safety. Even with today's new technology, such as asset tracking, the overall system is hard to implement everywhere, because there is resistance to change. Additionally, there is not one standard information system that has been implemented. Different states and even regions use different applications. This ongoing problem causes resistance to achieving a

system that is nationally used. (2) Upper Midwest freight stakeholders should work to create a unified information-sharing system to facilitate the development of a regional intermodal shipping system.

Under-pricing has been a concern ever since deregulation. This causes many shortfalls for the shippers as they are unable to make a profit all the time. Under-pricing is a particular problem in the trucking industry. (8) They are constantly trying to slash their prices to compete with rail and water borne. This creates the problem of companies specializing in different modes of transport not working together to ship goods. Instead they are more concerned on how to make more money individually and maintain their market share. Furthermore, this breaks down the idea of intermodalism, which requires that these shippers coordinate with each other. This problem points to the need for the Upper Midwest to craft a regional solution to coordination between shipping modes.

These barriers appear large, but can be overcome by working to move intermodalism to the forefront of the shipping industry. This is possible to achieve due to the efficiency, environmental benefits, and congestion management potential of this type of shipping.

THE FUTURE FOR INTERMODALISM

Intermodalism will grow and change as FHWA continues to support improving global connectivity and freight security. FHWA plans to oversee some steps to bring intermodalism into the future. Intelligent Technology Systems will continue to be evaluated by cost and benefit. Research, testing, and evaluation of new technology will be explored in the movement of goods. Further work with federal agencies will advance freight mobility and security. Additionally, working cooperatively with international partners will help develop a standard to move freight. (2)

Overall, intermodalism needs to become faster, better, smarter, and more profitable. It is and will be a crucial factor in the future of the supply chain. With the broadening of intermodalism, there will be a need for education and training for those who are new and old to the idea of integrating shipping modes. Information and communication systems will be needed to execute intermodalism and its technology. Consumers will begin to demand a better shipping system as the industry becomes more efficient, meaning all modes of shipment will need to come to an understanding that intermodalism is the most efficient and profitable form of transportation to meet the US and world's needs. (9)

The Upper Midwest region is uniquely positioned to take advantage of the benefits of intermodality and freight shipping. The region's location at the country's crossroads, location of significant sections of the interstate highway

system, possession of a functioning freight rail system, ability to ship via inland waterways or the Great Lakes, and a solid airport network positions the states of the Upper Midwest to take full advantage of intermodal freight possibilities. These possibilities must be worked on using a regional perspective to garner the greatest benefit from any intermodal system that is put in place.

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