

Intermodal Freight Transport Committee Problem Statements

In May 2001, Tina Casgar, Chair of TRB's Section A1B00 on Multimodal Freight Transportation (now the Freight Systems Group), proposed that 12 committees and task forces comprising Section A1B00 develop research problem statements for a proposed Cooperative Freight Research Program. In response to this request, the Intermodal Freight Transport Committee submitted seven problem statements which are presented in TRB's Transportation Research Circular Number E-C048. In March 2006, the Intermodal Freight Transport Committee revised several previous problem statements and developed two new statements. The revised and new problem statements are presented below.

Problem Statement Number 1

Title

Consolidating Freight Movement Origins and Destinations at Inland Distribution Centers

Problem

The Federal Highway Administration's (FHWA) Freight Analysis Framework forecasts that U.S. domestic freight volumes and international freight volumes will increase by 67 percent and 85 percent, respectively, between 1998 and 2020. The FHWA suggests that this growth, especially in international trade, is likely to present challenges to U.S. ports and border gateways. These challenges could be substantial for intermodal facilities where freight is exchanged between modes, for example, at marine facilities in the nation's leading ports.

The increasing importance of intermodalism was recognized in the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, the Transportation Equity Act for the 21st Century (TEA 21), passed in 1998, and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA LU), passed in 2005. All three bills included provisions addressing the need for states and metropolitan areas to develop transportation plans and programs that incorporate the importance of intermodal facilities. SAFETEA LU provided additional encouragement for intermodal freight transport, including the establishment and funding of a Freight Intermodal Distribution Pilot Grant Program. This program provides grants to 1) facilitate and support intermodal freight transport initiatives at the state and local levels to relieve congestion and improve safety, and 2) provide capital funding to address infrastructure and freight distribution needs at inland ports and intermodal freight facilities.

The proposed research is needed to help better understand the contribution of inland intermodal freight transport facilities to the nation's goods movement challenges. Findings from this research would support and complement various intermodal freight provisions and initiatives in ISTEA, TEA 21, and SAFETEA LU, and would help inform policy makers developing transportation funding legislation.

Objective

The primary objective of the proposed research would be to investigate the feasibility and benefits of consolidating intermodal freight movement origins and destinations at inland distribution centers. More specifically, this research would:

- Develop a commonly accepted definition of inland distribution centers and their role in consolidating intermodal freight movement origins and destinations,
- Review research on inland distribution centers since passage of the Intermodal Surface Transportation Efficiency Act of 1991,
- Prepare an inventory of inland distribution centers established during the last 15-20 years,
- Summarize the advantages and disadvantages of inland distribution centers,
- Identify successful inland distribution centers and factors contributing to success,
- Identify failed inland distribution centers and factors contributing to failure, and
- Prepare a guidebook of best practices to successfully consolidate intermodal freight movement origins and destinations at inland distribution centers.

Key Words

Best practice, destination, distribution center, freight, guidebook, inland, intermodal, origin

Related Work

1. Federal Highway Administration, *Review of Environmental Factors Affecting Intermodal Freight Transportation Facility Development and Expansion*, Washington, D.C., 2001
(http://ops.fhwa.dot.gov/freight/documents/final_report_01_01.doc).
2. DMJM Harris, *Port Inland Distribution Network (PIDN), South Jersey Site Evaluation and Feasibility Development Study*, prepared for the New Jersey Department of Transportation and Delaware Valley Regional Planning Commission, July 2003 (<http://www.state.nj.us/transportation/works/freight/pdf/sjpidnfr.pdf>).
3. Mottley, Robert, "New York-New Jersey's Inland Alternative," *American Shipper*, vol. 43, no. 6, 2001
(http://www.americanshipper.com/paid/JUN01/newyork_newjersey.asp#aaa).
4. Strom, Shelly, "Northwest Container Looks Outside the Hubs," *Business Journal of Portland*, November 12, 2004
(www.bizjournals.com/portland/stories/2004/11/15/story5.html?t=printable)
5. Transportation Research Board, *Financing and Improving Land Access to U.S. Intermodal Cargo Hubs*, NCHRP Report 497, Washington, D.C., 2003
(http://trb.org/publications/nchrp/nchrp_rpt_497.pdf).

Urgency/Priority

The proposed research is needed to help identify benefits and the economic, operational, and technical feasibility of establishing inland intermodal distribution centers for multimodal goods movement. The research is consistent with one of the nine priorities for research under the National Cooperative Freight Transportation Research Program, Section 5209 of SAFETEA LU; i.e., the feasibility of consolidating origins and destinations for freight movements.

Cost

\$250,000-\$300,000

User Community

American Association of State Highway and Transportation Officials, FHWA, metropolitan planning organizations, the private sector, state departments of transportation, U.S. Department of Transportation Research and Innovative Technologies Administration

Implementation

The proposed research might be implemented through state transportation agencies, metropolitan planning organizations, port authorities, and other entities working with the private sector and federal agencies to establish inland distribution centers that would consolidate freight movement origins and destinations at discrete intermodal nodes in the multimodal transportation network.

Effectiveness

The effectiveness of the proposed research would be evaluated by whether or not it is used by public and private sector entities potentially involved with planning for and establishing inland intermodal distribution centers. For inland distribution centers that are established, measures of effectiveness could include volume of freight moved through the center, cost savings to shippers using the inland center, number of trucks that move in uncongested or less congested traffic conditions with the inland center than without the center, adverse environmental impacts reduced or avoided in congested locations, and number of jobs created at the inland center.

Problem Statement Number 2

Title

Intermodal Connections for the Transportation of Containers by Pneumatic Capsule Pipelines

Problem

Many major seaports in the nation are over-crowded with containers. This contributes to congestion on roadways and air pollution in densely populated areas adjacent to port facilities. Along with concerns about congestion and pollution are concerns about safety and security at port facilities, especially as related to possible terrorist usage of containers to carry materials that if deployed could cause considerable damage and loss of life in nearby densely populated areas. Pneumatic capsule pipelines (PCPs) represent an alternative that could help address concerns about congestion, pollution, safety, and security. Such pipelines could be used to carry containers from port facilities to less populated inland locations where the containers could be stored, inspected, and distributed by truck or rail to intermediate and final destinations, thereby helping to address congestion and pollution concerns as well as potentially reducing the likelihood of damaging impacts from terrorists' activities in densely populated areas near ports.

Moving materials by pneumatic capsule pipeline is a relatively new technology which currently is being used in several locations. For example, PCPs are being used in Japan to transport minerals, construction materials, and solid wastes over short distances in circular pipes one meter in diameter or in one meter square rectangular conduits. To date, no system has been built to move containers by pipeline, but such a system was studied in 2003 in a project sponsored by the New York State Energy Research and Development Authority (see Related Work below). More detailed design and analysis are needed before such a system can be made operational. Other future research needs would include the investigation of design, financial, and other issues associated with intermodal connections at the two ends of the PCP conduit; i.e., the marine terminal on one end and a truck and/or train terminal on the other end.

Objective

The objective of this research is to investigate the planning and design of the intermodal terminals at the two ends of the PCP conduit: a marine terminal on one end for loading containers to and from ships, and an inland inspection/intermodal-transfer terminal or station for connection to trucks and/or railroads. The research would include investigating a terminal design that would accommodate two-way movement of containers between marine and inland terminals.

Key Words

Capsule, congestion, container, intermodal, pipeline, pneumatic, pollution, safety, security

Related Work

Research on moving freight by pneumatic capsule pipeline has been undertaken for at least 30 years. For example, in 1976 the U.S. Department of Transportation sponsored a comprehensive research project which addressed the history, technology development, economics, environment, and social impacts of freight pipelines. The study also planned and analyzed a 6-ft diameter PCP from Philadelphia to Chicago for transportation of general freight.

Fifteen years later, the Intermodal Surface Transportation Efficiency Act (ISTEA) included a provision requiring the US Department of Transportation to “conduct a study to evaluate the feasibility, costs, and benefits of constructing and operating pneumatic capsule pipelines for underground movement of commodities other than hazardous liquids and gas.” In response to this requirement, the Volpe National Transportation System Center conducted a study and issued a 1994 report entitled “Tube Transportation,” which investigated the technical and economic feasibility and environmental and safety benefits of PCPs. In 1996, the American Society of Civil Engineers (ASCE) held a national workshop on pipeline research needs, which was followed by publication of a workshop report that identified freight pipeline as a needed key research area. In 1998, the ASCE Task Committee on Freight Pipelines prepared a state-of-the-art assessment report published in the *Journal of Transportation Engineering*, Vol. 124, No. 4.

From 1991 through 2000, the National Science Foundation supported the Capsule Pipeline Research Center, University of Missouri- Columbia, to conduct research and development on various types of capsule pipelines, including PCPs. Among the results of this research was the development of an electromagnetic capsule pump that would greatly enhance the capability of PCP for long-distance transport of containers.

In 2003, the Freight Pipeline Company completed “Feasibility of Underground Pneumatic Freight Transport in New York City” under the sponsorship of the New York State Energy Research and Development Authority. The study concluded that five potential PCP applications, including one for transporting containers in large underground conduits, were cost-effective and had environmental and safety benefits resulting from the reduced usage of trucks.

Urgency/Priority

The proposed research would contribute to a better understanding of the technical and financial issues associated with intermodal connections at the ends of PCPs. A better understanding of these issues would contribute to future research on how PCPs can help address congestion, pollution, safety, and security issues in the vicinity of the nation’s seaports. These are especially urgent issues to address given concerns about possible terrorist activity at the nation’s seaports.

Cost

\$250,000

User Community

U. S. Department of Transportation, Department of Homeland Security, and the port authorities of various large container ports.

Implementation

Port authorities, private sector businesses, and federal, state, regional, and local governments would implement PCP technologies that are found to be technologically and financially feasible and which would contribute to public policy goals and objectives associated with reducing congestion and pollution while enhancing the safety and security of businesses and residences in densely populated areas.

Effectiveness

The research could be considered effective if governmental and port authorities use its results in assessing transportation alternatives for addressing concerns about congestion, pollution, safety, and security in and near major seaports in densely populated regions of the United States.

Problem Statement Number 3

Title

Land Use, Transportation, and other Issues Associated with Major Intermodal Cargo Hubs in Metropolitan Areas

Problem

Major intermodal cargo hubs often are located in or near the historic core of older metropolitan areas. Many cargo hubs were built before the widespread usage of motor vehicles. Cargo hubs, residences, and commercial areas tended to locate relatively near one another in part because transportation choices were limited, slow-moving, and expensive. Numerous business and residences moved away from the cargo hub as technology improved, core land values increased, and transportation options became cheaper. On the other hand, many businesses remained in or near the cargo hub due to advantages associated with clustering, the need to be near specialized transportation facilities such as waterways, and other reasons that varied among businesses.

As cargo hubs grew, their demand for space increased while the availability of appropriately zoned land diminished. In some cases, nearby land could be rezoned to industrial, or existing cargo hub property could be re-developed to accommodate growth. In other areas, options were limited for rezoning or redevelopment, forcing green field development of manufacturing and distribution facilities that continued to serve and rely on the cargo hubs in the urban core. In some areas, neighboring owners of non-industrial property objected to expansion of the cargo hub. And in yet other areas, owners of non-industrial property sought to force cargo hub uses away from their traditional core, or to re-zone vacant or abandoned property in the cargo hub to non-industrial uses.

These trends continue today. In many parts of the United States, lower costs of land and greater availability of developable land at the urban edge or elsewhere in the metropolitan area puts pressure on the transport system to off-set travel time and distance between these areas and cargo hubs. In some locations the demand for vacant or underused land contributes to pressures to rezone cargo hub properties from industrial to residential, commercial, and other uses. Further research is needed to address how to structure the transportation system to provide effective links between international and domestic cargo hubs, distribution centers, and manufacturing plants as congestion grows across the nation's metropolitan areas.

Objectives

1. Review the academic and non-academic literature on transportation, land use, zoning, economic, and environmental issues associated with major cargo hubs.
2. Summarize zoning, political, and other conflicts associated with land uses in and near major cargo hubs.
3. Develop case examples illustrating the zoning, political, and other conflicts associated with land uses in and near major cargo hubs.
4. Review site selection criteria and decisions of recently developed (e.g., last 8 years) manufacturing and distribution industries.

5. Identify best practices, strategies, or guidelines that have been or could be used to
 - reduce, avoid, and/or resolve zoning, political, and other conflicts associated with land uses in and near major cargo hubs, and
 - ensure efficient freight movement to and among manufacturing, distribution facilities, and cargo hubs.
6. Make research and other recommendations to address ongoing and future issues associated with land use, zoning, transportation, economic, and environmental issues associated with major cargo hubs in metropolitan areas.

Key Words

Cargo, hubs, intermodal, land use, transportation, zoning

Related Work

1. NCHRP Report 497, *Financing and Improving Land Access to U.S. Intermodal Cargo Hubs*, 2003
2. NCHRP Synthesis Report 320, *Integrating Freight Facilities and Operations with Community Goals*, 2003
3. NCHRP 8-36, Task 30, *Intermodal Freight Connectors: Strategies for Improvement*, August 2003
4. NCHRP 8-36, Task 33, *Best Practices in Statewide Freight Planning*, October 2003
5. NCHRP Project 8-47, *Guidebook for Freight Policy, Planning, and Programming in Small and Mid-Sized Metropolitan Areas*, in progress
6. NCHRP Project 8-53, FY 2005, *Integrating Freight into Transportation Planning and Project-Selection Processes*, in progress

Urgency/Priority

Commodity flow forecasts indicate that freight volumes and the demand for transportation services will continue to increase in areas with major intermodal cargo hubs. Meeting increasing demands will require a variety of measures to address the need for freight transportation facilities. Land use decisions can facilitate or worsen local, regional, and state governments' ability to address freight transportation needs, including those for major cargo facilities.

Cost

\$250,000-\$300,000

User Community

American Association of State Highway and Transportation Officials, Federal Highway Administration, Transportation Research Board, American Planning Association, American Institute of Certified Planners, Association of Metropolitan Planning Organizations

Implementation

Results of this research would help planners, economic development personnel, elected officials, and the general public better understand land use issues associated with major cargo hubs as well as transportation concerns associated with goods movement between

cargo hubs, manufacturing companies, and distribution centers in the urban core, the urban periphery, and other locations in metropolitan areas. Implementation would occur in part through local land use and transportation decisions that were “cargo hub friendly.”

Effectiveness

This research will be effective if state and local officials, land use planners, transportation specialists, economic developers, shippers, carriers, and other groups take into consideration the study’s findings when making transportation and freight-related land use decisions affecting cargo hub locations in metropolitan areas.

Problem Statement Number 4

Title

Public-Private Partnerships for Increasing Capacity in Rail Corridors

Problem

Rail capacity in many parts of the U.S. is stretched to its limits. At the same time, the freight railroad industry is entering an era of new constraints on its financial performance. Intermodal traffic is the fastest growing component of rail freight traffic and has put considerable strain on the capacity of the existing infrastructure. Further projected growth in freight overall and intermodal in particular will cause more capacity constraints and issues.

Public agencies face a similar situation: highways are over capacity, freight traffic is exploding, and the financial resources to accommodate growth are limited. Adding rail capacity provides significant relief in the intermodal supply chain while relieving the need for enormous costs in highway construction and maintenance. The *Freight Rail Bottom Line Report* issued by the American Association of State Highway and Transportation Officials (AASHTO) indicates that at the current investment level, the freight rail system could carry the same volume of freight in 2020 that it does today, but little more. With more freight added to the highway system, AASHTO estimates that over a 20-year window, costs to shippers would equal \$326 billion, costs to highway users would equal \$492 billion, and additional highway costs would equal \$21 billion (not counting additional maintenance and bridge costs).

As the demand for both freight and passenger transportation grows and the available land and funding resources dwindle, there is a need to maximize the use of all existing transportation facilities, including those privately owned. Today there are a few good examples of public-private partnerships (such as CSX in Virginia and the District of Columbia), but there is a need for more. The U.S. needs to analyze the benefits of public investment in rail infrastructure to benefit intermodal transportation commodity flow, including at major terminals, without diminishing private corporate activity and investments of the owning railroads.

Objective

The primary objective of this project is to identify the benefits of public investment in rail infrastructure to enhance capacity and efficient flow of freight. Specific objectives are to:

- Identify locations where rail capacity constraints exist,
- Identify where public investment in passenger rail infrastructure is anticipated,
- Quantify the cost of adding rail capacity,
- Identify a mechanism for the development of public/private partnerships for planning and implementation of such capacity improvements, and
- Quantify benefits to the U.S. economy at large from the implementation of rail capacity improvements, including highway cost savings and productivity gains.

Key Words

Benefits, capacity, congestion, corridor, freight, infrastructure, investment, partnership, private, public, rail

Related Work

1. American Association of State Highway and Transportation Officials (AASHTO), *Freight-Rail Bottom Line Report*, January 2003 (<http://freight.transportation.org/doc/FreightRailReport.pdf>)
2. Congressional Budget Office, *Freight Rail Transportation: Long-Term Issues*, January 2006 (www.cbo.gov/ftpdocs/cfm?index=7021&type=1)
3. I-95 corridor between New York and the Carolinas involving CSX, Norfolk Southern, Amtrak, and the states of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, and North Carolina (http://www.i95coalition.org/PDF/One%20paggers/One%20Pager_Rail.pdf)
4. Transportation Research Board, "Rail-Freight Solutions to Roadway Congestion," NCHRP Project 8-42 (<http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+8-42>)

Urgency/Priority

Public investment in rail freight projects has been rare. Yet, highway congestion is mounting and maintaining and expanding the infrastructure is becoming more difficult. As the global economy grows and intermodal traffic increases, the demand to move both people and freight is surpassing the available infrastructure capacity. Improved capacity of our rail corridors can provide critical relief, both physical and financial, for the nation's highway corridors.

Cost

\$200,000

User Community

American Association of Railroads, AASHTO, American Public Transit Association, Federal Highway Administration, National Highway Traffic Safety Administration, I-95 and other corridor coalitions, metropolitan planning organizations, state departments of transportation, U.S. Department of Transportation, and individual railroad companies

Implementation

The results of this study would help freight planners, commuter rail planners, high-speed rail authorities, and railroad freight carriers define key elements for structuring public-private partnerships. Cost sharing strategies would be developed to illustrate examples of how both freight and passenger transportation would benefit from new capacity. The *Freight-Rail Bottom Line Report* identified consequences of not addressing the challenges of freight capacity. The implementation of this effort would expand further some of the remedies required, and define more specifically a process to achieve them.

Effectiveness

Societal impacts would include reduced highway congestion, improved air quality and energy efficiency, reduced stress and maintenance costs on the highway network, improved freight systems, more competitive rail freight service, and increased passenger movement by rail.