

POLICY OPTIONS FOR INTERMODAL FREIGHT TRANSPORTATION



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Committee for Study
of Policy Options To Address
Intermodal Freight Transportation

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This report has been reviewed by a group other than the authors according to the procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The views expressed in the individually authored papers that are included in this report are those of the authors and do not necessarily reflect the views of the committee, the Transportation Research Board, the National Research Council, or the project's sponsors.

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Preface

This study of policy options for intermodal freight was initiated by the Transportation Research Board (TRB) Executive Committee in 1995. The Executive Committee recognized that freight transportation is of critical economic importance to the United States and that intermodal freight transportation is one of the major technological and organizational trends affecting the performance of the sector. The Executive Committee also recognized that the federal government and many state and local governments are working to accommodate public transportation facilities and programs to the needs of intermodal freight.

The Executive Committee decided to undertake a project that would highlight the importance of intermodal freight transportation efficiency, identify major impediments, indicate areas where research could resolve or reduce existing problems, and identify changes in public policy that could help foster more efficient intermodal freight movements. The scope of inquiry would focus on land access issues at intermodal freight terminals, including the public policy issues raised at major terminals serving interstate commerce, with an emphasis on the public role in resolving freight terminal access issues.

Intermodal freight transportation is any movement of goods that involves two or more modes of transport, for example, shipments of goods in containers that are transferred between truck and rail, and shipment of bulk commodities that involves transfer between rail and water. The total of all such movements accounts for a minority of U.S. freight activity, measured in physical volume of freight or in the cost of services. However, intermodal freight is critical in international trade,

in transport of many high-value products, and in military supply; it has been a source of trucking industry cost savings and rail industry revenue growth; and intermodal transfers, which often require coordination of government entities and multiple private-sector firms, can be physical and organizational bottlenecks affecting the performance of the entire freight system. Because it competes with single-mode freight, the intermodal option spurs efficiency in a large segment of the freight industry. The public sector is looking to intermodal freight as a means of controlling government highway costs, reducing pollution, and stimulating local employment.

Freight transportation is a joint enterprise of the private sector, government, and public enterprises (for example, public port authorities). Private firms provide direct services to shippers, but public enterprises and government provide major components of the infrastructure. It is important to review public-sector programs that serve freight to determine how well they are keeping up with rapid change in industry.

To conduct the study, TRB formed a committee that included members with expertise in intermodal freight transportation, state and local government transportation administration, and public policy. The committee was formed according to the procedures of the National Research Council (NRC) to ensure a balance of points of view.

The study committee examined policy issues confronting government officials at the federal, state, and local levels. The committee selected topics to complement and update other recent reviews of intermodal issues, including the report of the National Commission on Intermodal Transportation and U.S. Department of Transportation studies of impediments to intermodal freight efficiency. The committee decided that its contribution should be in the definition of principles to guide decisions as governments venture into developing the new kinds of transportation infrastructure projects and new forms of arrangements with users that will be needed to respond to changes in the freight industry. The committee's conclusions are in four areas:

- Principles for government involvement,
- Federal surface transportation programs affecting freight,
- Regulatory and operations issues, and
- Public finance of intermodal freight projects.

As sources of information for its report, the committee organized a workshop for government officials, industry executives, and researchers and commissioned a series of papers on special topics. The papers appear at the end of this volume, following the committee's report. The authors and titles of the commissioned papers are as follows:

- Randall W. Eberts, "Principles for Government Involvement in Freight Infrastructure";
- Jean Lauver, "Federal Surface Transportation Legislation and Freight";
- Daniel Smith, "Freight Projects of National Significance: Toward a Working Definition";
- Barrie R. Nault, "Information Technology for Freight Transportation Coordination"; and
- John E. Petersen, "Public-Sector Financing in Intermodal Freight Transportation."

The committee acknowledges the contributions that these authors have made to this report through their participation in the workshop as well as their papers. The authors are responsible for the contents of their papers.

This report has been independently reviewed according to procedures of the NRC Report Review Committee. Reviewers were chosen for their diverse perspectives and technical expertise. The purpose of the review was to provide comments to assist the authors and the NRC in making the report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following persons for their participation in the review of this report:

- A. Ray Chamberlain, American Trucking Associations, Inc.;
- John Glover, Port of Oakland, California;
- William J. Harris, Jr., Texas A&M University System;
- Lester A. Hoel, University of Virginia;
- David Luberoft, Harvard University;

- Bradley L. Mallory, Pennsylvania Department of Transportation; and
- Paul E. Nowicki, Burlington Northern Santa Fe Railway.

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The study was performed under the overall supervision of Stephen R. Godwin, TRB Director of Studies and Information Services. The study director was Joseph R. Morris. Frances E. Holland provided administrative and clerical support. Norman Solomon edited the report and the commissioned papers. Suzanne Schneider, TRB Assistant Executive Director, arranged the report review process for TRB.

The highlights of the consensus findings and recommendations of the study committee are given in the Executive Summary. The complete presentation of findings, recommendations, and policy options appears in Chapter 6. Background information on public policy issues concerning freight transportation and the scope of the study are described in Chapter 1, which should be read in conjunction with the Executive Summary by readers unfamiliar with the issues. The basis for the committee's conclusions is explained in Chapters 2 through 5.

Edward K. Morlok, Chairman
Committee for a Study of Policy Options To Address Intermodal
Freight Transportation

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PART 1

Report of the Committee

Executive Summary

A well-functioning freight transportation system is essential to national prosperity. Advances in freight transportation and logistics in recent decades have been a major source of productivity growth in the U.S. economy. Freight transportation is a joint enterprise of the private sector, government, and public enterprises; therefore it is important to review public-sector programs that serve freight to determine how well they are keeping up with rapid change in industry. The Transportation Research Board formed a Committee for a Study of Policy Options To Address Intermodal Freight Transportation to examine prospects for changes in programs to improve the efficiency of the freight system, and of intermodal freight in particular, in the light of recent experience.

PRINCIPLES FOR GOVERNMENT INVOLVEMENT

Governments are reexamining the scope of their involvement in freight transportation, investing in facilities not traditionally provided by the public sector (for example, intermodal freight terminals), and entering into new kinds of arrangements with the private sector in finance, construction, and operation of facilities. Clear guidelines and systematically developed information will be of value in the process of reaching decisions on government involvement.

Deciding on Government Involvement

Officials responsible for infrastructure should define criteria for government involvement in freight projects and specify how to test quantitatively whether a proposal meets each of the criteria. To warrant public-sector participation, a proposed freight infrastructure project must possess one or more of the following characteristics:

- The project will reduce external costs of transportation.
- It will yield external economic development benefits, that is, benefits that do not influence decisions of users of the facility.
 - It will redress an imbalance caused by subsidies to some class of carrier.
 - It is necessary for national defense.
 - It falls within the established government responsibility for parts of the infrastructure.

Subsidized Versus Unsubsidized Participation

Government participation in a freight project does not necessarily mean subsidy of the project. To justify a subsidized project, the government should demonstrate a clear welfare gain (usually from correcting a market failure) as grounds for intervention. Most commonly in the case of intermodal projects, the alleged market failure is the potential for obtaining the external benefits given in the preceding list. The justification ought to be supported primarily by quantitative estimates of the value of external benefits.

Analysis Tools

Governments should apply standard methods for evaluating infrastructure investment proposals. The performance of completed projects should be systematically evaluated according to established guidelines. The appropriate framework for evaluating intermodal freight project proposals is to quantify their direct effects as transportation projects: expected changes in shipper and carrier costs, changes in external costs such as pollution and congestion, and effects on the location of economic activity.

The federal government, cooperatively with the states and metropolitan planning organizations, should undertake research and tests to develop and demonstrate such standard methods. Research also is needed to measure and project freight system performance. Existing federal programs intended to facilitate intermodal freight should be quantitatively evaluated, and future federal initiatives affecting freight should incorporate program evaluation.

FEDERAL SURFACE TRANSPORTATION PROGRAMS AND FREIGHT

The committee examined options for provisions of federal surface transportation programs aimed at improving intermodal freight efficiency.

Use of Highway Trust Fund Revenues for Nonhighway Freight Projects

Increased flexibility to choose the kinds of projects that receive funding from federal highway user fee revenues would free states to manage their transportation programs by defining objectives and searching for the optimal means to attain them. However, expanding flexibility entails risks. First, it tends to undermine the user-pays principle. Second, it could fuel uneconomic interstate rivalries in development of facilities. Finally, transportation companies might come to routinely demand aid for private infrastructure improvements. Any expansion of flexibility ought to be designed to avoid these pitfalls as far as possible.

Project Selection and Priority for Freight Projects

Although federal programs influence local decisions, most problems concerning project selection priorities require local solutions. Obstacles to proper accounting of the needs of freight in local transportation investment decisions include lack of procedures to identify high-payoff freight-related projects, problems of coordinating multiple jurisdictions, and lack of established public-private relationships. Improved decision making will come about through expanded initiatives to

promote involvement of carriers and shippers in the public political processes of developing investment plans.

Projects of National Significance

The U.S. Department of Transportation's freight policy identifies, as a sphere of federal responsibility, a category of projects of national significance in which government involvement is justified but that state and local governments are unable or unsuited to carry out, because the national interest differs from the local, the scale of the project is beyond local means, or essential federal responsibilities are involved. A top-down, federal government-driven approach to such projects may be necessary in special cases. However, for most projects, a bottom-up approach, under which local governments and private parties develop proposals and seek federal government participation in them, has advantages. The federal government's most effective role in such projects, when they are outside the bounds of conventional federal surface transportation aid projects, would be as a provider of backup credit and as an absorber of risk rather than as a source of grants.

The goal of system optimization and the decentralized nature of decision making in the U.S. economy and government do not inherently conflict, although sometimes they conflict in practice. Such conflicts can be lessened when local governments have mechanisms for recouping costs of public facilities through user fees and for compensating parties that bear external costs, and when they are not induced by external aid to undertake uneconomic projects. Federal policy should seek to bring about these conditions.

Overall Structure and Size of the Federal-Aid Program

The size of the federal surface transportation program—the dollars authorized and disbursed for highways and other transportation projects—is the characteristic of the present program with the greatest effect on freight. Highways are the major government responsibility affecting the intermodal freight system. Resources sufficient to maintain adequate highway system performance are essential for intermodal freight efficiency.

REGULATORY AND OPERATIONS ISSUES

Government affects the efficiency of the freight system through its responsibilities for operation as well as development of highways, ports, airports, and waterways.

Facilitating Application of Information Technology

Progress in linking information and transportation systems has been slowed by lack of interoperability, incomplete network infrastructure, and shortages of skills. Government can facilitate the application of information technology in freight by ensuring that its systems in areas such as customs and enforcement are interoperable with industry systems. Also, flexibility in applying regulations on anticompetitive practices may be advisable in some cases to permit industry collaboration on precompetitive aspects of transport-related information infrastructure.

The federal government should undertake research examining how the efficiency of information exchange in the freight system is affected by practices and requirements of government as a provider and purchaser of transportation services and as a regulator.

Economic Regulation of Freight Transportation

The federal government should examine how economic regulation of ocean and coastal shipping affects intermodal freight performance and use of port facilities.

Pricing Practices

Improved pricing of transportation facilities operated by governments, including highways, waterways, and airports, would yield pay-offs in improved freight efficiency. Improved pricing means charging each user fees and taxes that more closely match the costs (including net external costs) of providing service to that user.

PUBLIC FINANCE OF INTERMODAL FREIGHT PROJECTS

Decisions on financial responsibility and revenue sources will be critical not only to the feasibility of a public-sector intermodal project but also to its chances for long-term success. Mechanisms established for project finance can help ensure that necessary and valuable projects are built and that government avoids participation in projects with low payoff or little public significance.

Who Should Pay for the Project

Most transportation projects in which the government participates should be financed by user fees or private-sector contributions. In some projects, external benefits such as pollution reduction are an important part of the justification for government participation. In these projects each user ought to pay the net cost of its use of the service after deducting the public benefit, and government should make up the difference between revenues from users and project costs. If the intended external benefit is primarily local development, local government should provide the subsidy.

Innovative Mechanisms for Raising Capital and Operating Funds

Innovative finance techniques, which provide attractive terms for private-sector partners, expand debt financing, and stimulate development of new revenue sources like special tax districts and tolls, have the potential to increase and accelerate funding of public-sector transportation projects. If Congress and the states wish to promote use of these arrangements, increased direct federal capitalization of infrastructure banks, changes in certain tax-exempt bond finance restrictions, and removal of state legal barriers to public-private joint development will be necessary.

Rules for Use of Tax-Exempt Bond Finance

Expanding tax-exempt bond finance could have negative consequences. Tax-exempt finance entails a federal subsidy that may not

be regarded as equitable and that biases the capital market toward government-selected rather than private-sector-selected investments. If Congress decides to promote innovative finance, public-private partnerships, or privatization of some government transportation functions, then some reduction of differences in the tax treatment of publicly and privately financed infrastructure may be necessary. However, the rules should seek to avoid tax-exempt finance of projects that are unproductive or whose benefits are primarily local.

The federal government should conduct research on the costs and distributional effects of alternative financing mechanisms for public works projects and on the relationship of financing arrangements to the performance of public intermodal projects. Research that examines the experience of other nations with port and airport privatization is also needed.

1



Introduction: The Intermodal Freight System, Policy Issues, and Study Scope

In the past two decades freight transportation has been transformed from an industry dominated by regulation and resistant to innovation to a dynamic sector contributing to productivity growth and driven by rapid technological, market, and organizational change. The transformation has been important for the U.S. economy as a whole. Freight expenditures were \$440 billion in 1995. Thus, even incremental productivity gains yield major benefits.

Freight transportation is a joint enterprise of the private sector and government. Private firms provide nearly all direct services to shippers and own transportation equipment and components of the infrastructure, including the rail system. Government provides major infrastructure components—highways, ports and harbors, airports and airways,

and inland waterways. Because the industry has undergone rapid change, it is important to review government programs that serve freight to determine whether they are keeping up. Government infrastructure and other programs affecting freight must be flexible to match the dynamism of the industry.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which governed the disbursement of nearly \$30 billion in annual revenues from fuel and vehicle excise taxes for highways and other transportation purposes, was one important step toward a new government approach to serving the freight sector. The act's Declaration of Policy states:

It is the Policy of the United States to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy, and will move people and goods in an energy efficient manner.

The National Intermodal Transportation System shall consist of all forms of transportation in a unified, interconnected manner, including the transportation systems of the future, to reduce energy consumption and air pollution while promoting economic development and supporting the Nation's preeminent position in international commerce. (P.L. 102-240, Sec. 2)

ISTEA, together with complementary legislation enacted in 1995, had provisions to raise the priority of projects serving freight in highway spending programs, allow more flexibility in using federal funds for freight projects, and make way for new forms of public-private ventures. Although the act refers specifically to intermodal transportation, its provisions affect the entire domestic freight transportation system.

The nation now has 6 years of experience with ISTEA. Also in this period, state and local governments have initiated a variety of freight development initiatives, often in partnership with the private sector (and often independent of the provisions of ISTEA). The congressionally chartered National Commission on Intermodal Transportation (NCIT), the Federal Highway Administration, the Transportation

Research Board (TRB), and other organizations have published reviews of government policies toward freight and the performance of ISTEA. Some parties have expressed disappointment with the performance of ISTEA programs as means for promoting freight development. NCIT concluded in 1994 that “planning and policies, particularly at the Federal level, do not encourage and accommodate intermodalism” (NCIT 1994, 3). The American Association of Port Authorities’ policy on ISTEA reauthorization stated, “The Nation needs policy and program changes that will result in funding for projects to facilitate freight . . . , a goal which has not been achieved under the current program” (American Association of Port Authorities 1996).

A 1996 General Accounting Office (GAO) review found, “The total amount of funds obligated for intermodal freight projects through roughly the first 4 of ISTEA’s 6 fiscal years . . . equals . . . less than 1 percent of ISTEA funds apportioned to the states during that period . . .” (GAO 1996, 2). GAO did not explicitly conclude that this share was inappropriate, but the GAO study conclusion illustrates why some parties advocating a more active government role may be dissatisfied with ISTEA.

To continue this review, TRB’s Committee for a Study of Policy Options To Address Intermodal Freight Transportation has examined prospects for changes in government programs to improve the efficiency of freight transportation in the light of recent experience. In the remainder of this introductory chapter, the sources of dynamism in freight transportation today and the government’s role in freight are described, and the specific public policy issues that the committee has examined are identified.

THE INTERMODAL FREIGHT SYSTEM TODAY

To understand the economic importance of intermodal transportation, it is essential to view intermodalism in the context of broader technological developments in freight and logistics.

Transportation, Logistics, and Productivity

Advances in transportation technology and logistics management practices are yielding important benefits throughout the manufacturing and

trade sectors of the U.S. economy. Productivity gains in business logistics compared with the previous year reduced costs by \$23 billion in 1995, a savings of nearly \$100 per capita. Savings in 1995 compared with 1989 productivity levels were estimated at \$150 billion, according to Cass Information Systems projections (Schulz 1997). Logistics is the management of movements and inventories of materials, goods in process, and products from suppliers through production and distribution to customers. Logistics costs include the costs of transportation and warehouse operations and inventory carrying costs.

Achieving these savings has required restructuring of manufacturing, distribution, and even product design. A recent news item illustrates a typical case:

[A computer manufacturer] chose nine dealers to be the first that will complete assembly of its personal computers for businesses, a key step in the transformation of its delivery process. . . . [The company] will deliver unfinished PCs to the firms, which will then add memory chips, modems and other parts based on customer specifications.

The move is designed to reduce distributors' inventories of completed products, a cost-saving step that [the company] hopes will allow it to price its PCs closer to those of direct shippers. . . . With less inventory, [the company] will be able to incorporate new technology without first having to sell a large amount of existing models. (*Wall Street Journal* 1997, B6)

This example illustrates how redesigning logistics lowers costs in industry by reducing inventory and allowing suppliers to respond more quickly and precisely to changes in demand and technology. The drive to attain these kinds of economies dictates the service qualities that shippers seek from freight transportation, for example, reliability and real-time information about the location and expected arrival time of shipments in transit.

One principal source of gains in logistics productivity has been coordination of the elements of the process through application of information and communication technologies. Information system improvements provide shippers and carriers with more complete and timely information about goods in transit and in inventory

and about changes in circumstances that determine requirements for shipments and inventories.

Intermodal Freight

Intermodal transportation, in the narrowest usage of the term, refers to transport of goods in containers that can be moved on land by rail or truck and on water by ship or barge. Containers save handling costs when freight must be transferred from one mode to another (e.g., from ships to trucks); also, a truck-rail container movement can yield a savings compared with truck alone if the cost of the transfer (the cost of the added handling of the container plus the cost of the difference in speed and reliability between truck and intermodal) is offset by rail's lower cost per ton mile. Container traffic has grown rapidly: the numbers of containers and piggyback semitrailers (highway trailers loaded on flatcars) carried by railroads doubled between 1983 and 1994 (Association of American Railroads 1997, 26). Growth has slowed since then but has remained strong (*American Shipper* 1998). In addition to containers, intermodal freight usually is understood to include bulk commodity shipments that involve a transfer (for example, combined rail and barge movement of grain from farms to ports) and air freight, which always travels to and from airports by truck. The total of all such movements accounts for a minority of U.S. freight activity, whether measured in physical volume of freight or in the cost of services. However, intermodal freight is critical in international trade, in transport of many high value-added products, and in military supply; it has been a source of trucking industry cost savings and rail industry revenue growth; and intermodal transfers, which often require coordination of government entities and multiple private-sector firms, can be physical and organizational bottlenecks affecting the performance of the entire freight system.

The term "intermodal" often is used as a shorthand or exemplar for the important overall advances in freight transportation and logistics of recent years. For example, one of the consequences of changes in the industry is that carriers, which traditionally have defined their businesses by a mode (e.g., they are trucking companies or railroads), have begun to redefine themselves in terms of services offered rather than

the mode of carriage. The chief executive of a British trucking firm, among the first in Europe to offer warehousing services in addition to truck transport and an early user of computers and intermodal, describes his business as follows:

Today we are a logistics contractor. . . . We manage flows into and out of the warehouse or distribution center, which could involve using our own fleet, a dedicated solution or a subcontractor's network. That's why we say we are logistics managers, not truckers. (Parker 1997, 24)

Intermodal is one of the elements of the wave of technological change affecting logistics. It is one more option increasing flexibility for shippers and offering opportunities for cost savings, and it is a foremost case of the value of coordination in the logistics process. The success of intermodal depends on information technology applications. Information technology has allowed carriers to mitigate intermodal's reliability problems, which arise from added handlings and the involvement of more parties in each freight movement.

These private-sector advances in logistics and freight transportation, while still maturing, are established features in the economy, not a development that is predicted or that is dependent on government leadership for fulfillment. The policy concern that this study has addressed is whether government transportation programs are adequately meeting the needs of this rapidly changing freight transportation market.

Intermodal Freight as a Public Policy Issue

ISTEA was evidence of increased awareness of intermodal freight transportation on the part of government. State and local government transportation departments and economic development agencies also have shown great interest in promoting freight intermodalism. A confluence of factors has stimulated this attention:

- Some state departments of transportation have been attracted by the potential of truck-rail intermodal for relieving pressure on state

highway systems and have considered state investments in intermodal facilities as possibly cheaper alternatives to highway expansion. Although productivity growth has reduced freight costs relative to the size of the economy, freight volumes are growing. Traffic of freight-carrying trucks is projected to increase 21 percent by 2006 compared with 1996 (Schulz 1998). State departments of transportation are also interested in the potential of public-private transportation developments as a means of augmenting their transportation budgets.

- Regulatory officials and environmental interests see truck-rail intermodal as a means of reducing pollution and helping to meet air quality regulatory requirements, because rail transport generates lower emissions per ton mile than truck.

- The enactment of ISTEA stimulated awareness of intermodal and made the term a focal point of public discourse on transportation policy. ISTEA's framers apparently had intermodal passenger transport more in mind than freight. In concrete terms the act's provisions affecting use of Highway Trust Fund distributions for public transit probably have been more important, but ISTEA did provide some limited funding to intermodal freight projects.

- State and local officials concerned with economic development have pursued public involvement in intermodal freight projects, especially port access projects, and have supported increased availability of federal funding for this purpose. State and local governments have traditionally viewed ports as engines of employment and growth. Also, certain ports have experienced rapid increases in trade volume, putting pressure on existing facilities. Recently other kinds of intermodal freight projects (for example, truck-rail intermodal terminals) have been pursued as public-private ventures viewed, from the public-sector side, primarily as economic development opportunities.

In summary, freight intermodal is seen by many of the public-sector participants as a means to ends considerably more diverse than simply improving freight transportation efficiency. Primary motivations more often are controlling highway agency costs, reducing pollution, and stimulating local employment. These are legitimate responsibilities of government; however, in this study, the committee has taken the perspective that an essential criterion for judging public-sector freight transportation programs should be the effect on

the efficiency of the freight transportation industry. Projects that enhance freight productivity generally will have the greatest chance of success in attaining other public goals. Such projects will be well-used by carriers, will be viable for the long term, will generate the strongest stimulus for local economies, and will have the greatest effect on pollution, congestion, and accidents.

Of course, intermodal movements use the same infrastructure, equipment, and organizational systems as single-mode freight, with the exception of certain terminal and transfer facilities. Thus, for example, a well-functioning highway system is an asset to truck-rail intermodal freight as well as to all truck transport. Analogously, the questions concerning government programs and investment decisions that are most important for intermodal freight efficiency are, for the most part, the same questions that are most important for the efficiency of all freight services.

STUDY SCOPE

This study was undertaken on the initiative of the TRB Executive Committee to review recent experience with government programs affecting intermodal freight transportation, identify options for changes in public policy that could help foster more efficient intermodal freight transportation, and indicate areas where research could resolve problems. The study committee has limited its conclusions concerning particular policy issues to identification of the leading alternatives for addressing recognized problems or capitalizing on opportunities. Decisions on these alternatives involve compromises among competing objectives, and assessments depend on whether the perspective is federal, state, or local. Selecting the best option will be a matter of political debate, analysis, and experimentation. The committee has made recommendations in the more general areas of principles for government involvement and the framework for evaluating projects and programs, and on research needs. The committee examined questions of government policy that affect the overall efficiency of freight transportation, including the important market niches of intermodal freight.

The committee addressed issues at the federal government level, including the scope of federal responsibility, federal-aid programs, and

regulatory issues. It also addressed issues that confront state and local governments, including project selection and finance. Although the illustrative examples in this report describe for the most part highway and rail operations and projects, the committee's conclusions and recommendations are relevant generally to the performance of all the domestic freight modes, including air freight and waterways.

The committee selected topics to complement and update several past reviews of intermodal policy. ISTEA mandated a study of freight and passenger intermodal policy issues by NCIT, a specially created commission. In its 1994 report, *Toward a National Intermodal Transportation System*, the commission found "significant barriers to the development of a fully integrated National Transportation System," including road and rail access to intermodal terminals (NCIT 1994, 3). Its 12 policy recommendations were grouped into three areas: federal intermodal transportation policy, public investment levels in intermodal transportation, and government organization. Several other recent and thorough reports have addressed intermodal issues. The Federal Highway Administration review *Intermodal Freight Transportation* (1995) analyzed impediments to intermodal freight growth and described the development of intermodal freight in the United States, the provisions of ISTEA and other government programs intended to promote intermodalism, and recent specific innovative public-sector projects aimed at promoting intermodal freight. TRB policy studies on *Intermodal Marine Container Transportation* (1992) and *Landside Access to U.S. Ports* (1993) examined port and maritime intermodal problems. These past analyses provided the starting point for the work of the present study.

Issues and policy options in the following four areas are defined in Chapters 2 through 5 of this report:

- **Principles for government involvement:** The committee examined what the guidelines should be for deciding the forms of government involvement in freight-related activities that are in the public interest and what practical analysis tools governments need to evaluate individual proposals for developing freight facilities.
- **Federal surface transportation programs and freight:** The committee examined how federal surface transportation programs have served the needs of freight and considered options for provisions of federal programs aimed at improving intermodal freight efficiency, including the overall structure of the federal program, rules governing use of

funds for nonhighway freight projects, consideration of freight benefits in setting project priorities, and the identification and accomplishment of freight infrastructure projects of national significance.

- Regulatory and operations issues: The committee examined opportunities for government agencies to improve the performance of the ports, airports, roads, and waterways that they operate and opportunities to improve the cost-effectiveness of regulations.

- Public finance of intermodal freight projects: The committee identified the factors that federal, state, and local public officials should take into account in making finance decisions for individual projects and for public works programs.

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Abbreviations

FHWA	Federal Highway Administration
GAO	General Accounting Office
NCIT	National Commission on Intermodal Transportation
TRB	Transportation Research Board

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2



Principles for Government Involvement

Governments in the United States are being called upon to alter their roles and priorities in the provision of facilities for freight transportation. For example, governments are investing in facilities not traditionally provided by the public sector. Such projects often involve new forms of cooperative arrangements with the private sector in finance, construction, and operation of facilities. At the same time, governments are considering proposals for privatizing some traditionally public kinds of transportation facilities—ports, airports, and highways.

At the federal level, each time Congress specifies the types of projects eligible for funding through federal transportation aid programs, it is faced with the fundamental policy question of defining the appropriate scope of government involvement in transportation. At the state and local levels, the question of the appropriate government role arises, for example, when the government responds to a private-sector proposal for public participation in a rail access project.

The committee has made recommendations concerning three policy issues: criteria for government involvement (that is, defining the cir-

cumstances that justify public participation in a freight infrastructure project), the decision as to whether government involvement should entail a subsidy to freight activities, and analysis tools and methods to help governments decide on the merits of project proposals. The committee also developed guidelines for deciding whether public participation in a project is in the public interest. The guidelines are not a recipe for decision making. Rather, the committee's intent is to argue that standardized procedures would be useful and to offer a starting point for developing such procedures. Actual practical guidelines will have to be tailored to the needs of individual jurisdictions and be subjected to testing and evaluation.

Government investment decisions in this area are complex and involve a balance of competing economic and political interests. Local government decisions give economic development considerations great weight and often hinge on the availability of external funds. National decision making encompasses a broader set of concerns for economic efficiency and equity. No step-by-step procedure or technique of rational analysis can be used mechanically to prescribe the correct course of action in every case. Nonetheless, systematically developed information will be of value in the political process of reaching decisions.

The next section explains how government roles in freight transportation are being altered. Then policy issues concerning criteria for government involvement, justification for a subsidy, and analysis tools are presented, along with the committee's proposed approaches to each of these issues. In the final section of the chapter, guidelines to aid in these decisions are proposed.

CHANGING GOVERNMENT ROLES IN FREIGHT

As background to consideration of specific policy questions, it is necessary to understand how government responsibilities and relationships with the private sector in freight transportation have been changing. In this section the traditional scope of government involvement in infrastructure for freight transportation is described. Examples of new kinds of projects that government is being asked to carry out are given, and the motivations for these new projects are described.

Established Government Roles

Government involvement in intermodal freight transportation is already pervasive, and its influence on freight efficiency is great. The major government functions are as follows:

- Infrastructure investment in ports, highways, inland waterways, and airports;
- Operation of these freight transportation facilities;
- Finance and taxation: government collects taxes from freight service providers and charges fees (including fuel taxes and registration fees) to users of some public facilities, and it pays capital and operating expenses of public infrastructure with user fee proceeds, general tax revenues, or borrowing;
- Regulation: important categories of regulation that affect intermodal freight are land use (e.g., zoning, wetlands preservation), other environmental rules, truck size and weight, transportation safety, and antitrust; and
- Research, data collection, planning, and education in a variety of economic and technical fields important for public- and private-sector transportation decision making.

Each of these five activities is conducted at all levels of government—federal, state, and local. The problem for public policy is to discover how to coordinate this complex array of government activities to make freight transportation more efficient from the perspective of the public as a whole.

The extent of government involvement differs among the freight transportation modes for reasons that arise as much from historical circumstance as from fundamental economic differences among the modes. The traditional government roles in each mode are as follows:

- Highways: infrastructure provision and operation, with finance mainly through national and state trust funds and user excises.
- Marine transport and seaports: port infrastructure provision and operation, with the private sector providing certain facilities; regulation of rates and entry in certain segments (the only mode in which signif-

icant economic regulation continues). Funding is primarily through fees on local users and port tenants; a national trust fund receives revenues from user excises for harbor dredging.

- Inland waterways: infrastructure provision and operation (locks, dams, channels, navigation aids); terminals are mostly privately provided. Funding is mainly from general revenues; secondarily, and at a modest level, from a user excise on fuel.

- Railroads: no major government responsibility for infrastructure or operation, with limited exceptions. Several states have programs providing financial assistance to short-line and regional railroads.

- Aviation: airport infrastructure provision and operation, with the private sector providing certain facilities; provision and operation of air traffic control facilities. Funding is primarily from local payments by operators and other airport tenants and a trust fund receiving revenues from user excises.

In addition, operators in all modes are subject to safety, environmental, labor, and antitrust regulations. The Surface Transportation Board of the U.S. Department of Transportation retains some oversight of rates, mergers, service abandonments, and common carrier obligations in rail and (to a lesser degree) trucking, but most economic regulation of these modes was ended in the early 1980s. In highways and aviation the government provides facilities and services that are shared by freight and passengers; therefore one of the difficult public policy issues is allocating services and spending among these classes of users. In all modes, it is the private sector alone that owns and operates the cargo-carrying vehicles or vessels and provides services directly to shippers.

New Forms of Government Involvement

There have always been exceptions to the general pattern of government involvement in freight. However, certain kinds of projects departing from traditional roles have become prominent in recent years. The four examples described in this section include project proposals as well as projects completed or under way. Chosen from scores of similar projects, they illustrate some characteristics of these new kinds of government activities. The examples were not chosen as mod-

els for other jurisdictions to emulate; indeed, they highlight some of the risks of such developments. The committee did not analyze whether these projects have been, or promise to be, successful in meeting the sponsoring governments' goals.

Of course, more traditional kinds of public works projects remain of vital importance to intermodal freight transportation. In particular, construction and improvement of public roads to improve access to ports and other terminals is recognized as among the greatest needs.

- Auburn, Maine, Rail Intermodal Terminal (Hickling Lewis Brod 1995, 1–5): A joint project of the state, the city, and a local shortline railroad developed a facility for transfer of containers and semitrailers between truck and rail. The terminal opened in 1994 and was to serve primarily paper shipments from Maine to Chicago. The state and city fully funded construction of the facility, which is leased by the city to a private operator. Of the \$2.9 million construction cost, \$2.3 million was from the state's Congestion Mitigation and Air Quality (CMAQ) funds. CMAQ, a federal-aid program created by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and drawing on the Highway Trust Fund, can be used to fund highway or nonhighway transportation projects that reduce air pollutant emissions in areas that are not in compliance with federal air quality standards. The project qualified for CMAQ funding because it was expected to reduce truck traffic and highway congestion (FHWA 1996, 2-13-2-16; FRA 1996, 3-7-3-8).

- Baltimore Port Access Proposal (Phillips 1996): Baltimore and other northeastern ports compete intensely. Nearby states have undertaken projects to improve rail access to their ports. In Pennsylvania, for example, the state contributed \$34 million to a project completed in 1995 to enlarge tunnels, lower the railbed, and reconstruct overpasses over rail lines, including road bridges, in order to provide clearances to allow double-stack rail container service across the state to the Port of Philadelphia. Conrail, on whose lines most of the Pennsylvania improvements were carried out, reported its contribution to the project as \$64 million. Double-stack trains carry standard freight containers stacked two deep and are the most efficient means of railroad carriage of containers. East Coast ports consider double-stack access to be essential in competing for container traffic.

In 1996 Baltimore had no double-stack service. The port was served by CSX and Conrail. CSX was blocked from providing double-stack service by low clearance in the Howard Street tunnel in Baltimore. Conrail could have provided double-stack service with a more modest investment but apparently did not find offering such a service attractive.

In 1996 CSX proposed to the state of Maryland that the state undertake the reconstruction of the Howard Street tunnel to allow double-stack clearance and that the state pay for adding parallel track to certain CSX lines that are shared with the state's MARC commuter trains. CSX argued that congestion on the shared lines caused by the passenger traffic prevented the railroad from upgrading its freight service to the Port of Baltimore. CSX also proposed that the state seek to use federal-aid highway funds for these purposes under existing programs or through the new surface transportation bill. It is not clear whether the project would have qualified for federal aid under program rules, which in general do not allow spending for rail improvements, although conceivably CMAQ funds could have been used.

The pending split-up of Conrail between CSX and Norfolk Southern changed the competitive situation at the Port of Baltimore. Norfolk Southern announced plans, if the split-up were accomplished, to begin double-stack service to the port using Conrail track it would acquire and to expand intermodal service to the port with its bimodal RoadRailer service (a technology that uses special highway semitrailers that can be placed on sets of rail wheels to move on tracks, eliminating the rail flatcars that carry normal containers and piggyback trailers) (Norfolk Southern Corporation n.d.). The Norfolk Southern proposal dampened state enthusiasm for the CSX proposal's expensive tunnel reconstruction, so the project has not proceeded in its original form.

- Port of Oakland Joint Intermodal Terminal Project (Glover 1995): This project aims to create a joint intermodal rail yard for ship-to-rail transfer of containerized cargo. When the project was conceived, three railroads served the port. Two (Union Pacific and Southern Pacific) owned or leased facilities at the port, and the third (Burlington Northern Santa Fe) loaded containers hauled by truck 18 km (11 mi) from the port to its yard in Richmond, California (*Intermodal Connections* 1996). The objectives of the project are to increase container-handling capacity, increase shipper options, reduce local truck traffic, and free a part of the shoreline to make room for port expansion. The initial challenges were to convince three rail-

roads to share one facility, to convince the federal government to give the port a long-term lease at nominal cost for an adjacent unused military base, to convince the Federal Highway Administration (FHWA) that the project was ISTEA-eligible, and to fit the project into the local transportation capital program.

An initial proposal was to obtain half the project funding from the state's allocation of ISTEA funds and half from the three railroads and the port, but that level of federal support proved not to be feasible under federal-aid rules. Local government priority scoring of the project in its capital program was high, largely on the basis of the expected reduction in truck trips on regional highways. The projected cost of the project rose steeply because the two railroads already in the port demanded full compensation for their current facilities.

As in the Baltimore case described earlier, a rail merger, in this instance between Union Pacific and Southern Pacific, affected the interests of the parties. The railroads have now agreed to support the project; however, a funding package is not yet in place. Planning activities have received \$10 million from an ISTEA program, but substantial federal capital funding will be possible only if reauthorized surface transportation legislation changes eligibility requirements or special legislation is enacted. In seeking federal assistance, the port may argue that federal assistance to the Alameda Corridor rail and highway access project at the ports of Los Angeles and Long Beach will upset the competitive balance unless aid is also given to other West Coast ports.

- **New York City Full Freight Access Program:** New York City has no direct rail intermodal service because of inadequate bridge clearances, conflicts with passenger rail traffic, and other impediments. All intermodal service is provided by drayage from intermodal yards across the Hudson River in New Jersey. New York State, in cooperation with the port authority and New York City, has developed an ambitious plan to improve rail service to the city and reduce reliance on trucks for goods movement. The plan includes elimination of clearance restrictions; development of an intermodal terminal, the Harlem River Yard in the Bronx; and construction of a new rail line, the Oak Point Link, connecting the Harlem River Yard and another yard to the Conrail mainline. The terminal is to be developed and operated by a private developer under contract to the state. The state's projected cost for the program is \$300 million. Construction of the rail link was begun in

1983, and development rights to the terminal were awarded in 1989. The link has not yet been completed, and the terminal is not in operation. The terminal and rail link project is regarded as critical to the future of rail freight in the region; however, FHWA (Brown 1997) and the New York State Comptroller (State of New York 1997) in 1991 questioned whether the project as it is now conceived will meet its objectives and have called on the state department of transportation to reassess its plans before proceeding.

The project illustrates some of the basic difficulties of government-led freight transportation development projects. To be successful, projects must match the requirements of the private-sector freight industry. These requirements are influenced by frequent changes in markets and technologies. Yet public-sector infrastructure projects can take a decade or more to plan and carry out, and public-sector decision makers may not understand well the needs of private-sector users and are subject to multiple and sometimes conflicting political demands.

Common Elements and Differences in the New Projects

These projects have several elements in common that distinguish them from most government transportation infrastructure investments:

- They involve direct public support of construction of a facility normally provided by the private sector (in these cases, rail facilities). Similar issues are raised if government builds or upgrades a road or other public facility in a category traditionally provided by government, but to meet the needs of a single private-sector user (e.g., a road connection to a terminal) (*Traffic World* 1997). [As an example of a road improvement for a freight user, United Parcel Service will expand its Philadelphia air hub as a result of a state agreement to extend a road to the facility (*Traffic World* 1997).]
- They involve some form of public-private partnership, that is, a contractual relationship between the government and one or a few transportation firms to cooperate in construction and operation of facilities, under which both contribute funding and other resources.

- They depend on a complex mix of funding from multiple sources. The mix may include local application of federal highway aid, facility user fees, use of government-issued tax-exempt bond finance, government loan guarantees, contributions of land or facilities, general government revenues, and contributions from the private-sector parties.

At the same time, these new kinds of infrastructure projects are diverse, and the preceding examples have important differences:

- Intermodal projects may be instigated by a private-sector party, general government seeking to make up for a perceived failure of the private sector to provide needed services, or an entrepreneurially motivated public port.

- The size and public share of total project costs vary greatly. Some truck-rail intermodal terminals developed with public participation have cost a few million dollars; the largest intermodal port-related developments cost 1,000 times that amount. The source of the government's share may be primarily user fees or it may be general revenues or external government aid.

The reasons why governments become interested in these projects are diverse. As noted earlier, state departments of transportation have been attracted to the concept of truck-rail intermodal as a means of relieving pressure on state highways and highway budgets. Truck-rail intermodal is seen as an aid in meeting air quality objectives, and some federal aid is available to state and local governments for projects that can claim to reduce pollutant emissions. Local governments view the projects as economic development opportunities, and public ports view them as opportunities to increase their business and revenues. Improving the efficiency of the freight transportation system from the perspective of the direct users often is not an explicit or primary objective of all the government entities involved.

The examples of projects given earlier indicate several policy questions that governments face when confronted with similar proposals:

- What is the rationale for government involvement in each case, as opposed to leaving investment and development decisions entirely to the public sector?

- What is the rationale for a subsidy of an activity that is normally or frequently carried on exclusively by the private sector?
- If these justifications are valid in principle, what information and analysis are necessary to ensure that they apply in specific cases and to make the case that the public effort will be likely to yield the intended public benefits?
- To what extent are local gains from a project also national gains, or is the effect of the government intervention just to redistribute economic activity from one locale to another? Would the private sector carry out the project on its own (even if in another form or in another location) if the government did not contribute?
- Is it fair for the federal government to support a project that may be detrimental to development hopes in other regions (e.g., a project that affects competition among seaports)? Does the availability of federal aid make it easier for states to conduct projects with weak economic justification?
- What should be the sources of funds supporting the project? Is user fee financing an option?

Local governments approach these questions pragmatically rather than philosophically: if funds are available for an economic development project, it appears attractive from the local political and economic perspective, and the project would not be carried out without public involvement, then they will support it. However, the federal government, which sets the rules for most tax, transportation aid, and development programs, has need for principles that take into account the benefits and costs to the public as a whole in defining the appropriate government role.

In this chapter, criteria for government involvement are proposed, circumstances that justify a subsidy are described, and needed evaluation tools are identified. The issues of the federal role and finance methods are addressed in Chapters 3 and 5, respectively.

DECIDING ON GOVERNMENT INVOLVEMENT

In general, to evaluate a possible public investment or an incentive or subsidy to encourage a private-sector investment, the government must

- First, determine that the investment would be worthwhile (i.e., that it passes a benefit-cost test and has a higher payoff than alternative investments), and
- Second, determine that the private sector would not undertake it on its own. A project may yield a good return and still be unattractive to the private sector if some public benefits cannot be captured in market transactions (that is, there are external benefits) or if institutional barriers stand in the way.

Federal government investment is justified if the project passes these two tests and yet local and state agencies would be unwilling or unable to undertake it.

Mistakes in project selection will occur, so program evaluation is essential for long-term success. Retrospectively, governments can examine each completed project to determine whether it was actually as beneficial as intended and whether it would have been feasible as a pure private-sector project. Over time, government agencies can improve the performance of their intermodal freight infrastructure projects through this process of review.

For freight infrastructure projects, the case for government involvement depends on the following considerations:

- Intermodal freight as a means to reduce external costs of transportation: An external cost is a cost imposed on others through a mechanism other than a market price. Intermodal freight, especially intermodal developments that have the effect of shifting some freight from truck to rail, can reduce pollution and congestion. These benefits are not properly evaluated in the private market for freight services. Therefore, government involvement to obtain them may be justified.
- External economic development benefits: Proponents argue that major transportation infrastructure improvements can yield efficiencies in the transportation system beyond those recognized by individual private-sector participants. Jobs created by an infrastructure development project in a region of high unemployment may constitute another form of external economic development benefit. Such benefits are called external because they are net gains to society but do not in themselves generate incentives to the private sector to invest.

Only in rare circumstance would a project that did not generate direct transportation and logistics cost savings sufficient to cover its costs be

justifiable on account of external economic development benefits. Part of the direct cost savings to users will be passed on to other producers and to consumers throughout the community and the nation, but this redistribution of benefits occurs as the result of any successful investment or development—private as well as public—and is not in itself justification for government involvement.

- **Offsetting subsidies:** It is argued that the trucking industry receives a subsidy because the fees it pays in the form of fuel taxes and other excises are less than the cost of providing roads for trucks to use, and that government intervention is appropriate to redress the market imbalance. Similarly, a port may argue that federal aid to a competing port justifies aid to it.

A closely related argument is that the net cost to the state transportation agency of providing capacity to accommodate freight growth by subsidizing intermodal facilities may be less than the cost of expanding highway capacity, net of any increased highway user revenues. The recent federal highway cost allocation study has provided new information to assess such arguments. It shows that (in contrast to earlier years) some classes of trucks are paying their allocated costs, whereas others are not (DOT 1997, 15).

- **National defense or other public safety need.**
- **The established government responsibility for major parts of the transportation infrastructure:** Every government investment and operating decision regarding highways, ports, waterways, and airports affects the efficiency of intermodal freight. No private-sector freight development can go forward without some form of support and coordination with the government infrastructure.

If government involvement cannot be justified on one of these grounds, the project belongs in the private sector.

Government officials responsible for infrastructure ought to define such criteria for involvement as general rules or principles to follow. The U.S. Department of Transportation (DOT), for example, has a list of principles defining grounds for federal involvement in its *National Freight Transportation Policy Statement* (DOT 1996b, 3–4).

At least as difficult as defining principles is applying them in specific cases to evaluate project proposals. Specifications concerning how the responsible agency will quantitatively test whether a proposal meets each

of the criteria should accompany the statement of principles. Justifications for the kinds of new government freight transportation projects described earlier usually refer to such criteria. However, the justification often is merely asserted and not supported by quantitative evidence.

SUBSIDIZED VERSUS UNSUBSIDIZED PARTICIPATION

Government participation in a freight infrastructure project does not necessarily mean subsidy of the project. A critical part of the decision on public involvement is deciding between subsidized and unsubsidized participation.

A government subsidy is any cost imposed on taxpayers as a whole to pay for benefits that are initially received by users of the freight facility. The subsidy may be direct and overt or indirect and difficult to quantify. Forms of subsidy include contributions from general revenues, transfers of public land below market prices, access to tax-exempt bond finance, loan guarantees, exemption of revenues from income taxation, property tax exemption, or failure to charge users of a government-operated facility a fee that covers the cost of their use (Dowd 1988, 221).

Subsidized projects should carry a heavier burden of justification—government should demonstrate a clear welfare gain as a result of correcting a market failure as grounds for intervention. Most commonly in the case of intermodal freight projects, the alleged market failure is the potential for external benefits. The public investment should pass a benefit-cost test and should be shown to be the most cost-effective means available to achieve the intended benefit. The benefit-cost analysis must quantify external benefits and the value of avoiding external costs (like air pollution or congestion). A subsidy for a transportation project might also be justified as a means of carrying out a government policy of redistributing wealth among regions of the nation or a state. This study has not considered whether subsidies to intermodal freight projects would be an effective means of redistribution compared with alternative programs.

Alternatively, a government agency might plan a project to be entirely self-supporting from user fees and private-sector participant contributions. If government involvement takes the form of providing public facilities, for example a road or a public port facility, and if fees that

cover their costs to the government are collected from the users of these facilities, then no subsidy is involved.

After a period of expanding use of economic development incentives in recent decades, governments recently are taking a more cautious and selective approach to proposals for public-private development partnerships that involve subsidies (Phillips 1997). Sports stadiums are an example of a type of project that has commonly received subsidies and is now being regarded more skeptically (Ward 1996).

A degree of skepticism is essential if public-private partnerships are to remain viable means of infrastructure finance for the long term. Projects that fail to live up to their promises will undermine willingness to support future partnerships. Analyses of public-private joint developments have concluded that public officials will be at a disadvantage in dealing with private-sector developers if they lack clear objectives and do not have the analytical tools to assess the benefits, costs, and feasibility of projects (Kaplan 1990; Nunn 1991).

Subsidized intermodal freight projects have risks that ought to be taken into account in evaluating proposals:

- Projections of benefits of intermodal projects as low-cost alternatives to highway capacity expansion or as a means of reducing highway external costs are highly uncertain and have to be demonstrated quantitatively to make the case for a subsidy. The proposals must be compared with alternative methods of achieving the same ends.
- The willingness of users to pay for an unsubsidized project proves that benefits exceed costs; therefore the risk that resources are being used inefficiently is greater if the project is subsidized.
- The subsidy is a transfer from nonusers to users of the subsidized facility. The transfer may be regarded as inequitable if the taxpayers who bear the burden of paying the subsidy do not share in the benefits of the project.
- Conventional analyses sometimes overstate net economic development benefits by confusing redistributions with net gains (e.g., geographic redistribution of employment and transfers of the benefits of efficiencies from carriers to their customers and to property owners).
- Subsidies to trucks that are built into existing highway user taxes could be a justification for offsetting subsidies to alternative modes. However, the magnitude of this subsidy is disputed (TRB 1996b).

- Government-imposed solutions to intermodal freight problems may supersede preferable solutions that the private market would reach without intervention. Government is not solely motivated by considerations of freight transportation efficiency. Market distortions caused by government interventions will have costs from lost efficiency. In particular, subsidies can lead to overcapacity.

- If a publicly backed project becomes obsolete or turns out to have been a poor decision, it may prove politically difficult for the parties to cut their losses.

- Programs intended to be targeted incentives have a tendency to become routine over time and so lose their effect. If subsidies for freight infrastructure development were liberally available, transportation companies and major shippers might come to expect and require such aid.

Whereas the justification of subsidies to a project depends on projections of external benefits, the rationale for government involvement in a project that pays its own way depends on established responsibilities and special competencies of government. Circumstances that justify public involvement in these cases include the following:

- State and local governments historically have a monopoly on the road business, and this circumstance is not likely to change greatly in the near future. The most important change needed in government policy to improve intermodal freight efficiency may be for better evaluation of the direct benefits of road improvements to freight users. This would entail proper methods of identifying needs for connectors to ports and other intermodal terminals. Freight interests sometimes argue that highway agencies have tended historically not to see freight as a customer or constituent and that highway projects with relatively large freight benefits have systematically failed to get the priority they deserve, on benefit-cost grounds, in road programs.

- Certain government agencies (in particular, ports) are independent, self-supporting entities, and a few make profits. As long as governments operate such facilities, they should behave entrepreneurially, seeking investment and marketing opportunities to improve their returns. Such a government enterprise would be expected to enter into joint arrangements with private-sector firms to make facilities expan-

sions and improvements that would increase the net revenues of the private firms, financed by its expected increased revenues. For example, a port may conclude that its attractiveness to ocean carriers and shippers would be enhanced by increasing the number of railroads with access to the port and might enter into joint ventures with rail firms to this end.

- Government may have a role as facilitator or broker. There may be situations where, because of institutional complexity, only government can provide the impetus to reach a solution. Multiple jurisdictions may be involved, or the use of eminent domain may be justified. In such cases government may be able to function as a leader or red-tape cutter but still require that fee revenues from facilities cover the cost of the solution.

Analysis tools and clear guidelines for decision making would allow governments to decide whether a subsidy to a project is in the public interest and to avoid the potential pitfalls of subsidies.

ANALYSIS TOOLS

State and local governments need standard methods and basic data for evaluating freight infrastructure investment proposals. Data are needed that would allow governments to evaluate demand forecasts, modal diversion forecasts, and estimates of effects on congestion and pollution. Of equal importance, the financial and economic performance of completed projects and facilities in operation should be systematically and uniformly evaluated according to established guidelines. With honest evaluation of past projects the public sector can learn from experience and improve the performance of its infrastructure investments.

Development of benchmarks would be of great practical use in evaluating existing or proposed transportation facilities. A benchmark is a systematic comparison of performance measures (e.g., measures of physical efficiency, cost, and rate of return) at similar existing facilities with the facility being evaluated. Benchmark comparisons for freight facilities should include state-of-the-art facilities abroad as well as in the United States.

DOT policy recognizes the necessity of benefit-cost analysis to support public transportation investment decisions. DOT's policy

statement concerning ISTEA reauthorization recommends that “ISTEA’s successor should encourage state and local officials to base investment decisions on systematic cost-benefit analysis . . .” (DOT 1996a, 8–9), and its National Freight Transportation Policy notes that “the Office of Management and Budget has established guidelines for the economic analysis of Federal infrastructure investments. The guidelines apply rigorous cost-benefit standards to all proposed investments” (DOT 1996b, 5–6).

However, state and local governments often have not applied a systematic benefit-cost framework to evaluating intermodal freight public-private partnerships. Their evaluations reveal uncertainty about how to assess novel kinds of projects according to diverse goals and criteria. For example, in preparation for a 1994 Transportation Research Board (TRB) conference, public authorities were asked to describe economic impact analyses of selected case study intermodal freight projects. The Alameda Corridor Authority provided this summary:

By 2020, the growth of the ports and the Alameda Corridor will generate an additional \$31.9 billion in federal taxes per year, including \$5.2 billion per year in additional customs receipts. Growth of the harbors will generate an additional 700,000 jobs regionwide and 2.2 million jobs nationwide by 2020. Construction of the project itself will employ 10,000 workers in the central Los Angeles area between 1995 and 2000. Economic development along the corridor will be enhanced because of improved traffic conditions, including reduced delays for customers, employees, and residents of the area. (TRB 1996a, 50)

The economic effects of an Illinois UPS terminal constructed with government participation were described in the same source as follows:

In addition to the initial construction investment, state and local taxing bodies will greatly benefit by the increase in tax revenues. Direct and indirect payroll is estimated to reach nearly \$72 million per year when UPS reaches full operating capacity. (TRB 1996a, 55)

Evaluation of a transportation improvement ought to start with assessment of transportation benefits compared with project costs.

Because transportation benefits are not quantified, these two assessments are inadequate as full evaluations of the projects. In addition, the employment and fiscal estimates in these two examples must be considered with caution. Effects on employment and government finances often are central to state and local government project evaluations. These effects are relevant to government decisions and should be estimated, but such projections are difficult. Employment effects cannot be forecast with the precision that these citations imply. From the national perspective, and often even from a regional perspective, these effects can represent redistribution of jobs rather than net job growth. Estimates of tax effects sometimes do not take into account the cost of providing public services for the tax-generating facility.

A more useful framework for evaluating intermodal freight project proposals is illustrated by the Federal Railroad Administration's RAILDEC analysis procedure, a benefit-cost framework that evaluates a carefully considered list of public and private benefits and costs (FRA 1996, 5.1–5.7). TRB's *Special Report 246* (TRB 1996b) also illustrates a method for evaluating social costs of freight transportation that could be adapted for evaluating infrastructure proposals. These analyses concentrate on quantifying and valuing direct effects of transportation projects: changes in shipper and carrier costs and changes in external costs of pollution, accidents, and congestion.

A standardized analysis procedure such as RAILDEC must be supported with continual review and updating. Comparisons must be made between estimates of social costs in the evaluation procedure and estimates from other sources and from new research. Agencies should compare actual outcomes with those predicted or assumed in the prospective analysis to validate the analysis procedure.

The primary utility of standardized evaluation procedures is to provide a structure for rational analysis and a factual basis for public discussion of government decisions rather than a single bottom-line evaluation of net benefits or costs. Quantitative economic evaluations involve uncertainties. Estimates of externalities, which are important in justifying many government intermodal activities, are probably the most uncertain. Nonetheless, benefit-cost analysis has the value of forcing decision makers to expose and scrutinize, within a standard, accepted framework, the justification for the project, the costs and expected payoffs, and the assumptions that underlie these projections.

GUIDELINES FOR DETERMINING THE SCOPE OF PUBLIC-SECTOR PARTICIPATION

The guidelines proposed here are an effort to synthesize consideration of the issues identified in the preceding sections into a checklist for organizing the information needed to evaluate public-sector and public-private proposals for intermodal freight infrastructure projects. The steps are mostly obvious, and many public agencies follow similar procedures when planning infrastructure investments.

Nonetheless, some public infrastructure projects, even those supported by extensive impact analyses, go forward without benefit of some of the critical evaluation steps suggested here (Kaplan 1990). Public-private intermodal freight projects, because of their novelty, lack established evaluation procedures. These evaluation guidelines are suggested as a starting point for local jurisdictions to develop their own. Any such formal evaluation procedure would be a complement to the essentially political process of public debate and discussion that is the basis of major public works investment decisions.

The evaluation of infrastructure proposals hinges on a fundamental question: what criteria should government administrators apply to choose between alternative actions (in this case, between alternative public works investments)? The criteria that are selected constitute a definition of the public interest. Economics alone cannot provide the criteria. The test known in economic theory as the Pareto criterion is a necessary condition that any chosen option should meet: do not choose an action if there is a feasible alternative that makes some members of the public better off and makes no one worse off. However, this rule does not solve the problem of choices that help some and hurt others. For example, a state government decision to change investment priorities to allow construction of projects to facilitate freight access may leave peak-hour commuters worse off, compared with the status quo. The judgments of fairness that such choices depend on necessarily are made through the political process. The criterion applied in these guidelines is social benefit-cost analysis: in choosing among competing uses of funds, government decision makers should favor projects that yield the greatest net benefits. The guidelines rely on the simplifying assumption that a limited set of options is available to decision makers. This assumption holds, for example, in the case of federal surface transportation aid: a fixed sum

is available, all the funds will be spent, and only certain categories of expenditures are eligible. Often, however, the decision is more complicated: local governments must decide whether to spend tax revenues for transportation rather than education, public safety, or other government programs or to reduce taxes. The guidelines cannot tell governments how to make these global choices, but information from the prescribed project analyses would be useful in these decisions.

The value of these guidelines depends on the extent to which requirements or procedures for rational analysis can influence government decisions. In the judgment of the committee, development of better economic information would change the set of projects that are selected, and the changes would increase the public benefit of transportation programs. The committee did not study how economic information has affected government investment decisions historically. However, it probably would be possible to document important instances of rational analysis leading to better decisions in the public transportation sector. As one example, pavement management systems, widely used by the states to plan highway maintenance programs, have improved the cost-effectiveness of maintenance expenditures. These systems have not supplanted political decision making; rather, they have exerted an influence on decisions that remain essentially and appropriately political.

The study committee commissioned a paper, "Principles for Government Involvement in Freight Infrastructure," by Randall W. Eberts, as background for this topic. That paper is the primary source for the guidelines. The paper appears in Part 2 of this report.

Step 1: Ask questions about the market for the proposed intermodal freight facility.

- Are there internal benefits (i.e., benefits to users) from providing the facility?
- Is the existing facility operating beyond capacity and creating bottlenecks?
- Would the new facility or expansion reduce the average cost of operations and thus provide transportation services at a lower price?
- Would the new facility create intermodal opportunities where none were previously available?

- Do bottlenecks exist that impede efficient access of transportation modes to the intermodal facility?
- Could additional modal connections further enhance the utility of the proposed facility?

These are all questions about whether a market exists for the use of the new or expanded facility.

If the answer to one or more of these questions is yes, then calculate the expected revenue and costs of the operation and the projected deficit in terms of net present value. If there is an appreciable possibility that costs will exceed revenues, a decision must be made as to whether a subsidy is justified.

Justification for government subsidies to help finance the deficit projects depends on sufficient levels of external benefits. Estimation of externalities is very difficult, but Step 2 provides a rough method for doing so.

If direct benefits appear likely to significantly exceed costs, ask why government involvement is needed at all in the project. Public-sector funds might be substituting for private-sector investment. There may be justification for public involvement in such a project; for example, government participation may be necessary to overcome institutional obstacles, or the government may already be involved as the operator of roads, ports, or other facilities that will form part of the project. However, in these circumstances no subsidy is justifiable because user fees sufficient to cover costs could be assessed.

The evaluation does not require government collection of proprietary cost data. Rather, the necessary analysis is a market projection asking what demand for the new facility would be at various levels of service and user charges. Market forecasting techniques used in the private sector will be applicable.

The public sector's ability to assess the transportation benefits and market potential of infrastructure projects serving freight will depend on its contacts with the private sector. Local officials and the freight industry will need to establish working relationships for exchange of information to allow governments to identify and evaluate projects that would yield freight benefits.

Step 2: Determine the existence of external benefits generated by the intermodal freight facility.

TABLE 2-1 Checklist of Possible Internal and External Benefits of Intermodal Freight Projects (Eberts, Part 2; TRB 1996b, 32–35)

BENEFIT	INTERNAL	EXTERNAL
Reduction in total freight transportation cost	✓	
Reductions in accident costs		
Users of intermodal facility	✓	
Nonusers	✓	✓
Reductions in network congestion delay		
Users	✓	✓
Nonusers		✓
Reduction in pollution costs		✓
Economic development	(see Step 3)	

Use a checklist like the one in Table 2-1 (with modifications dictated by the nature of the project being considered) to determine what external benefits may be generated by the facility.

As the table indicates, the major categories of external benefits usually will include reductions in accidents, congestion, and pollution. (External economic development benefits are addressed in Step 3.) In the table, “users” of the intermodal facility means freight users (e.g., commercial vehicles on an access road, but not private vehicles). “Internal” benefits are benefits that users would have some incentive to pay for obtaining. “External” benefits are benefits that the users would have no incentive to pay for. For example, the table shows accident reduction as partly internal and partly external because users are liable for part, but not necessarily all, of the costs of accidents.

Estimate first the value of the external benefits that can be quantified with the least uncertainty. Then ask, How close does the value come to meeting the projected deficit? If the external benefits that are easiest to quantify are not sufficient to justify the subsidy, estimates of the more uncertain benefits must be made, keeping in mind the downside risk that the more uncertain the projection of benefits, the greater the chance that they will never be realized.

The value of this step is not just the single number for the value of external benefits that is derived. Rather this analysis indicates how great external benefits would have to be to justify the project and makes expectations and assumptions clear and public (DeCorla-Souza et al. 1997).

Step 3: Estimate economic development benefits.

Estimate the number of additional jobs and the increase in total wages that might be generated by the new or expanded facility.

Economic development benefits can be valued as the increase in net income of residents of the community as a result of the net increase in employment. It is important to estimate the part of the apparent employment effect that represents additional jobs rather than geographic rearrangement of employment. Finally, in examining a project from the national perspective, it is necessary to examine the likely effect on other potential and existing freight system developments.

The employment effect is sometimes the most difficult one to integrate with the analysis. From the local perspective, new employment may be the greatest net economic gain, whereas from the national perspective, the new jobs in the region of the project are just the result of local residents capturing some of the benefits of the nationwide improvement in freight transportation efficiency that the project causes. If a project proposal is being analyzed as a possible federal government investment, and direct benefits in the form of direct transportation facility user benefits and reduced external congestion, pollution, and accident costs have already been counted, then crediting the project with some additional benefit stemming from increased wages and salaries will usually be double counting and therefore an error. Any employment increase attributed to a project is likely to represent a net increase (as opposed to a geographic redistribution of employment) only in exceptional circumstances, for example, if it occurs in communities with chronically substantially higher unemployment than the regional or national average.

Step 4: Compare the project with the payoff from alternative uses of the public resources and with alternative means of attaining the intended benefits.

The appropriate comparison may be with other projects in the state or local area's transportation capital improvement program or with other nontransportation local infrastructure projects or public services.

If external benefits from improved air quality and reduced congestion are an important part of the project's justification, comparison should be made with other ways of attaining these benefits.

This step establishes priorities among competing uses of funds. Comparison of a comprehensive set of costs and benefits among alternatives constitutes a benefit-cost analysis of the proposal.

Consider the option of no government action. At this point in the analysis the required information has been assembled to decide whether government involvement is necessary according to the criteria defined earlier in this chapter.

Step 5: Examine who would receive benefits and bear costs.

The key questions are as follows: If the project will generate spillovers in the form of increased or reduced pollution and congestion, will certain local jurisdictions or neighborhoods be disproportionately affected? What share of the initial mobility-enhancement benefits of the transportation investment will local citizens ultimately receive through increased wages, property values, or tax revenues (net to added governmental costs)? For each of the finance options under consideration, how will the cost burden be distributed among local and national taxpayers and private-sector participants?

Firm quantitative answers to these questions will probably seldom be attainable, but the questions should be addressed directly in analysis and public discussion.

Step 6: Determine whether a subsidy is necessary, which level of government ought to provide the subsidy, and the mechanism of finance.

At this point in the analysis the necessary information has been assembled to decide whether a subsidy to the project is justified according to the criteria specified earlier in this chapter. Allocating responsibility for a subsidy, if one is justified, is primarily a question of fairness to be settled through the political process. One method of distributing the burden of the subsidy that may be regarded as equitable is as follows. To the extent that the project subsidy is justified by local economic development benefits, the subsidy should be contributed locally. Subsidies justified as means to reduce external costs should be contributed by the taxpayers that match in general the pop-

ulation that would bear the costs if the external costs were internalized through imposition of pollution or congestion fees. For example, if pollution reduction from reduced truck travel is part of the project justification, and if the trucks are carrying goods bound to and from nationwide markets, then taxpayers nationwide would be assigned responsibility for the subsidy.

Recognize the full costs and risks involved. Subsidies are never free, even if they do not appear as budget outlays. Tax-exempt bond finance and loan guarantees entail public costs. All such costs should be quantified, and the parties who will bear the costs should be identified. Risks should be examined explicitly: if use and revenue projections are not realized, what will be the consequences and who will bear the costs?

The examination of the distribution of benefits and costs in Step 5 will help in the analysis of finance options.

Step 7: Follow up.

Compare the results of completed projects with projections. Retrospective evaluations must follow uniform established procedures so that scorekeeping is fair and localities can learn from each other's experiences. A recent National Research Council study recommends methods for measuring the performance of public infrastructure improvements (NRC 1995), and a Resources for the Future study has recommended methods for evaluation of CMAQ transportation projects, including freight projects (Farrell et al. 1998).

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Abbreviations

DOT	U.S. Department of Transportation
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
NRC	National Research Council
TRB	Transportation Research Board

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3



Federal Surface Transportation Programs and Freight

The federal surface transportation program governed by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) exerts a major influence on the performance and development of intermodal freight transportation in the United States. This program is one of several federal public works programs that provide freight facilities. Other programs build, maintain, and operate the inland waterways; provide aid to airports; maintain the air traffic control system; and maintain harbors. The federal highway program in ISTEA is the largest of these programs and the most important for freight in the sense that trucking is the largest freight mode in terms of value of services provided. ISTEA was also important for intermodal freight because the act was the vehicle for declaring the new federal policy concern with intermodalism.

ISTEA was one of a series of reauthorizations of a program whose structure has remained essentially unchanged since the Federal Aid

Highway Act of 1956. The revenues collected and disbursed under these acts have been exclusively excise taxes on highway users, and spending originally was limited to highways. Revenues are credited to the federal Highway Trust Fund and apportioned to states by formula. States have primary responsibility for selecting projects and for building and maintaining roads. Innovations in ISTEA gave states greater flexibility in selecting the roads and projects on which federal-aid funds are expended, substantially increased the influence of local governments in project selection, and made possible expenditure of federal aid on nonhighway freight projects in certain very limited circumstances.

Extending allowed spending beyond highways has always been controversial. Starting with the 1973 highway act, a portion of highway user revenues was dedicated to mass transit. The 1991 act for the first time included categorical funding (most important, the Congestion Mitigation and Air Quality Program), which could be used by states for intermodal freight projects that included improvements to facilities (for example, rail lines and port facilities) that are not highways or highway appurtenances. A 1996 General Accounting Office (GAO) review concluded that the states have developed relatively few intermodal freight projects under these provisions; it identified 23 such projects involving \$36 million in federal aid (GAO 1996, 4). Of course, virtually every highway project is of benefit to freight transportation.

The debate on federal rules for allowable uses of transportation aid addresses one aspect of the fundamental question of the federal role in raising revenues, setting priorities, and choosing projects for transportation infrastructure. State and local governments argue that they usually are best positioned to identify needs and opportunities. However, national action may be most effective in certain circumstances. The 1988 report of the National Council on Public Works Improvement, created by Congress, specified the following principles for justifying federal, as opposed to strictly local government, involvement in public works (National Council on Public Works Improvement 1988, 86):

- The enumerated constitutional powers of the federal government justify its involvement.
- The fiscal magnitude of the project requires federal involvement.
- The project involves several states.

- Uniform activity is needed nationwide.
- Negative spillovers among states must be prevented.
- Efficiency or effectiveness can be significantly improved by a federal role.
- Redistribution of resources across the nation is needed.

The council applied these principles in considering the federal role in intermodal freight and concluded:

This issue [intermodal transportation] is nationwide in scope, important to the nation's competitive position in world markets, and linked directly to interstate commerce and industry. It is not now being addressed, and no other level of government is capable of dealing with it. (National Council on Public Works Improvement 1988, 94)

These guidelines seem reasonable, but, as noted in the preceding chapter, applying guidelines to specific projects (e.g., deciding whether efficiency can be significantly improved by a federal role) is difficult.

The committee examined four issues affecting intermodal freight that are related to federal-aid program provisions. The first three, use of Highway Trust Fund revenues for nonhighway purposes, project selection priority for freight-related projects, and projects of national significance, are specifically freight issues. The final policy issue addressed in this chapter, the basic structure of the federal-aid program, concerns decisions that are important for all components of the surface transportation system, passenger as well as freight, but have special implications for freight.

The study committee commissioned two papers on aspects of federal programs affecting intermodal freight. "Federal Surface Transportation Legislation and Freight," by Jean Lauver, analyzes the provisions of federal programs affecting freight, reactions of the interested parties to the freight provisions of ISTEA, and the issues that were prominent in the debate over reauthorization of ISTEA. "Freight Projects of National Significance," by Daniel Smith, examines how to define and identify such projects. These papers appear in Part 2 of this report.

USE OF HIGHWAY TRUST FUND REVENUES FOR NONHIGHWAY FREIGHT PROJECTS

ISTEA strictly limited the kinds of projects that could receive federal-aid funding. In general, a nonroad project serving intermodal freight (for example, a rail line to a port) was ineligible unless the project could be shown to reduce pollutant emissions in a region that is not in compliance with air quality standards.

Use of federal aid for nonhighway projects has been controversial. It has been opposed by the trucking industry and other highway interests and sometimes by state transportation agencies. Some freight groups support flexibility. The policy statements on ISTEA reauthorization of the Intermodal Association of North America (1996) and the American Association of Port Authorities (AAPA) (1996) both endorsed allowing state and local governments flexibility to use federal aid for nonhighway projects with few constraints. The Transportation Research Board (TRB) Committee for Study on Landside Access to Ports also recommended that the Federal Highway Administration (FHWA) adopt a liberal interpretation of ISTEA that would allow federal-aid funding of nonhighway projects that would relieve highway congestion (for example, facilities for coastwise shipping) (TRB 1993, 13).

The National Commission on Intermodal Transportation (NCIT), a panel that included a balanced representation of interests, was more cautious in its 1994 recommendation:

The Commission urges that these restrictions [on uses of federal trust funds] be minimized to allow states and MPOs the opportunity to evaluate investment decisions across modes and make modal tradeoffs. . . . Eligible projects should include: connectors that link the NHS, ports, . . . and . . . terminals; multimodal terminals . . . ; and rail and highway projects (e.g., bridge clearances, grade crossings, Amtrak, rail clearances, and other joint use projects that increase system capacity).

The commission's list of freight projects that should be eligible includes only facilities that have highway construction as a component.

The policy options open to Congress are to significantly expand state flexibility to conduct nonhighway projects with federal surface transportation aid funds, leave limitations similar to those in ISTEA in place, or roll back project eligibility rules to prevent spending for non-highway freight-related projects. A final alternative might be for Congress to delegate to the U.S. Department of Transportation (DOT) increased authority and flexibility to qualify projects for federal aid.

The argument in favor of flexibility is that states should manage their transportation infrastructure programs by defining transportation objectives and then searching for the optimal means to obtain those objectives, and that effectively limiting the permitted solutions to highways is an arbitrary constraint that will lead to suboptimal investment solutions. For example, a state transportation department might find that measures to facilitate truck-rail intermodal in a corridor would reduce truck traffic in the corridor and thereby relieve congestion and improve mobility at lower cost than expansion of highway capacity (considering agency, user, and social costs). Nonhighway uses of trust fund revenues may be defended as offsetting the effects of imperfect pricing of highways. Highway users do not pay for the effects of air pollution and the congestion delay they cause for others, and user fee payments are not well matched to highway agency costs attributable to individual highway users.

Serious arguments can be made against greatly increasing state and local flexibility in the use of federal-aid funds. First, the user-pays principle, however imperfectly it may be implemented, contributes to efficiency (because it ensures that users value the facility at least as much as the cost of providing it) and equity. If trust fund revenues are dispersed too widely, the alliance of interests that has supported the program will be eroded and the program will be in jeopardy. Second, liberal availability of federal aid may fuel uneconomic interstate rivalries in development of ports and other facilities.

Finally, if government aid, and especially federal aid, were liberally available for intermodal projects, railroads or other transportation companies or shippers might come to routinely demand aid for infrastructure improvements and threaten loss of economic activity to other locales if aid were not forthcoming. The influx of federal aid would increase the total volume of such investment, but many projects receiving aid would have been undertaken with private money if no govern-

ment aid were available, and those that would not have occurred without aid would be the marginal projects whose benefits would be most doubtful. States often would feel obligated to contribute just to avoid losing ground in economic development, but most would be no better off than if the federal aid had not been available at all. Meanwhile, the states would have less money to devote to traditional transportation priorities.

To monitor the consequences of increased funding flexibility, and as an aid to Congress in deciding on changes in eligibility rules, specific information about the nonhighway projects that have been funded under the existing program would be valuable. GAO, in its review of federal-aid intermodal freight projects, noted that a database of public intermodal projects is necessary to assess the performance of the federal-aid program (GAO 1996, 5). Information about the kinds of projects that would be funded with increased flexibility would also be valuable. Supporters of expanded intermodal freight project funding should provide examples of projects they would put forth under more liberal rules (that is, intermodal projects that would be worthwhile and that would require federal government involvement but that cannot be funded under existing rules). Projects for which federal-aid approval was sought but rejected by FHWA under ISTEA may indicate how the states would use more flexible funding.

If Congress expands eligibility, there may be provisions to mitigate some of the possible drawbacks described. For example, use of federal aid in nontraditional projects that met standards regarding user fee finance or private-sector participation might be allowed.

PROJECT SELECTION AND PRIORITY FOR FREIGHT PROJECTS

Freight interests have stated that in their experience, the provisions of ISTEA that emphasize flexibility and local participation in project selection have sometimes come into conflict with the goal of improving intermodal freight efficiency. AAPA, for example, has declared:

AAPA will support continuation of the structure envisioned by ISTEA with decision making authority primarily at the local level, *if*

changes are made to benefit freight. It must be recognized that local decision making favors passenger needs, and that freight projects, particularly those meeting regional or national needs, have difficulty obtaining funding under ISTEA. (AAPA 1996)

Options that have been proposed for actions by the federal government to influence local decisions on project priorities or to raise the priority of freight-related projects include the following:

- Creation of a freight-related funding category in the federal-aid program;
- Restriction of the role of metropolitan planning organizations (MPOs) in project selection on the theory that these bodies are least capable of recognizing freight needs (ISTEA strengthened the influence of local governments, acting through their MPOs, to influence how states spend their federal-aid funds);
- Mandate of freight representation in MPO decision making;
- Planning requirements calling for states to identify freight problems and solutions;
- An increase in the overall funding available from the federal-aid program or other public or private sources to make it easier for states and local areas to rearrange funding priorities; and
- Direct federal funding of individual freight projects of national significance.

Some of these options are probably politically infeasible. Addition of funding categories in the federal-aid program is opposed by the states; reduction of MPO authority also appears improbable. Federal planning requirements have yielded mixed results in the past. Although federal programs influence local decisions, problems concerning project selection priorities require local solutions.

Nearly all project-level decisions in government programs for investment in surface transportation are essentially political decisions made at the state or local level. Recognition of freight-related needs in public works programs will depend on the interactions between freight users and local officials. The local level is where the greatest need exists for concrete, quantitative understanding of the value of freight service improvements and the workings of the freight industry. Some of the

recognized obstacles to better local investment decisions concerning freight are the lack of planning procedures that reliably identify projects that would yield high freight-related payoffs, the problems of coordinating multiple local jurisdictions to conduct regional projects, and the lack of well-established public-private relationships in planning and finance of freight-related projects.

These local issues are both critical and difficult to address. Formal planning procedures like ISTEA's requirements for intermodal management systems and consideration of freight access in local plans have met with limited success. Less formal activities like the industry-sponsored Freight Stakeholders' National Network and FHWA's National Freight Partnership initiative are seeking to foster working relationships between state and local government and the freight industry.

Some state officials dispute the allegation that terminal access and other freight-related needs are routinely given too low a priority in state transportation programs. They argue that on the whole the states do an appropriate job of balancing freight and passenger interests in their programs, and that this balance is politically determined and is unlikely to be altered other than by increasing the amount of funds available from the federal government, the private sector, or the port authorities. Added funds would allow some projects to advance capital programs without retarding others.

Certainly, one way to raise the priority of port access projects in state and local public works programs would be for ports to increase their contributions to highway projects that benefit them. Increased port contributions to local projects would enable local areas to capture more of the benefits of improved intermodal transportation and promote local support of projects in the national interest.

The committee lacks evidence to evaluate the contention that state and local governments systematically underinvest in infrastructure needed to improve freight efficiency because freight interests have weak voices in local politics or because federal-aid program rules deny local governments flexibility to select investments with the greatest payoffs. It is important to know whether systematic underinvestment is occurring, because it could have serious consequences for the nation's economic performance. The necessary information to evaluate whether local spending priorities are biased against freight transportation could be obtained only through the kinds of investment analyses and follow-

up evaluations that the guidelines in Chapter 2 call for. Evaluations could be begun modestly, as a national or statewide pilot program involving a small sample of projects, to allow testing and demonstration of methods.

In these evaluations, a consistent finding of relatively high rates of return in public freight projects would indicate underinvestment. Similar evaluation of competing government transportation investments would be needed to determine whether local priorities are skewed in favor of passenger transport.

PROJECTS OF NATIONAL SIGNIFICANCE AND FEDERAL RESPONSIBILITIES

NCIT and DOT's *National Freight Transportation Policy Statement* refer to a category of projects of national significance as a sphere of federal responsibility. The DOT policy statement declares:

Federal participation may be appropriate when infrastructure investment projects have a national or regional significance or when Federal involvement may facilitate the resolution of a freight transportation problem. (DOT 1996, 5)

NCIT found:

The national intermodal transportation system should ensure funding of projects of national or regional significance. ISTEA's emphasis on local and State decision making means that projects of national significance which sometimes largely provide benefits beyond local or State jurisdictions, may not receive appropriate funding priority.

Congress should provide special funding annually to support some number of intermodal projects that are truly of national or regional importance. The Secretary of Transportation should solicit projects from the States and MPOs. . . . This project-specific funding would augment, not replace existing . . . funding . . . (NCIT 1994, 32–33)

Similarly, AAPA states, “There clearly is a vital role for USDOT in freight projects that cross multiple jurisdictions and that meet regional and national needs” (AAPA 1996). NCIT found that “such projects should be eligible for supplemental funds from the Federal government due to their national significance” (NCIT 1994, 16).

These statements raise questions for public policy:

- Is there a category of freight infrastructure projects with national economic significance and in which a federal leadership role and federal funding participation are essential?
- Which specific needs (either identified freight problems or project proposals) qualify as projects of national significance?
- Are new mechanisms needed at the federal level to identify such projects, finance them, and carry them out, or are existing programs adequate?
- Are federal actions needed, other than funding participation, to overcome institutional obstacles to such projects?

A “project of national significance” could be defined as a freight project that has important consequences for the performance of the nationwide freight system. However, the concept of a project with an essential federal government role is implicitly the definition that NCIT and DOT had in mind in the statements quoted earlier. State and local governments and private firms regularly carry out freight system improvements of large magnitude and nationwide importance without federal leadership. A “project of national significance,” as the term is used in the following, is defined as a project with an essential federal role.

The NCIT and DOT statements envision a category of intermodal freight projects that require government involvement but that state or local governments cannot be expected to support adequately because the benefits are national in scope. Two assumptions that underlie this conception ought to be examined critically: (*a*) that local entities lack motivation to carry out projects whose benefits extend beyond local boundaries and (*b*) that national significance makes a project worthy of a federal subsidy.

Neither assumption is true in all cases. Local economies have a vital interest, recognized by nearly all local governments, in sectors that serve

markets outside the region. Local economies are essentially export economies in the sense that a large share of all production of a local area is consumed outside the area (either in other regions of the country or outside the country). The local “export” sector is a primary source of jobs, income, and tax revenues. Local governments can capture a portion of the nationwide benefits of a transportation facility serving national needs through user fees and taxes. If the public facility or service is economically justifiable, revenues from these sources ought to be at least sufficient to cover the government’s cost of providing them and may even generate a local surplus, as some U.S. seaports do.

Criteria for deciding whether a freight project should receive a federal or local government subsidy are described in Chapter 2. In that chapter it is argued that a federal subsidy is justified when a project produces external benefits that extend nationwide or when a project reduces a local cost, like air pollution produced by factories, that consumers nationwide ought to pay for but are not. A project will not meet the criteria justifying a federal subsidy solely on the grounds that its benefits extend nationwide. Nationwide transportation cost savings and the economic consequences of these cost savings are not external benefits, because the owners of local facilities can capture part of these benefits by charging users.

Federal involvement may also be necessary in projects that do not receive subsidies. Some projects can support themselves yet require government involvement because they fulfill an established government responsibility. Of these projects, some require federal involvement because the scale or complexity of the project puts it beyond local capabilities, the risk can be borne more efficiently at the national level, or essential federal responsibilities are involved (for example, customs). A federal responsibility may be indicated when a public transportation infrastructure project is national in geographic extent and requires uniform design standards. Examples are the Interstate highway system, possibly certain multistate multimodal corridors such as the proposal described in the following section, and the air traffic control system.

Some candidate projects of national significance are described in the following section. The descriptions and the discussion of policy options that follows make use of two papers commissioned by the study committee: Daniel Smith, “Freight Projects of National Significance: Toward a Working Definition,” and John E. Petersen, “Public-Sector Financing in Intermodal Freight Transportation.” The conclusions are those of the committee.

Examples

A few locations, especially Chicago and Los Angeles, are mentioned repeatedly in discussions of national freight problems. The Alameda Corridor port access project in Los Angeles was NCIT's example of a project of national significance. GAO used the two cities as its cases of critical intermodal freight bottlenecks in a study of how local governments are using ISTEA provisions (GAO 1996, 6–7). The National Freight Partnership, a federal initiative to develop cooperative links between government and the private sector to identify and correct freight bottlenecks, has identified four projects as high national priorities: the Alameda Corridor, Chicago area intermodal interchanges, and two border crossings, El Paso and Laredo, Texas (FHWA n.d.).

The Alameda Corridor is a project to construct a consolidated rail route and an improved highway route to carry truck and rail traffic to and from the ports of Long Beach and Los Angeles. It would consist of 32 km (20 mi) of double track with 16 grade separations and reconstruction of a parallel highway (Smith, Part 2). The estimated total cost is \$2.0 billion (Preusch 1997). The project will be paid for with revenues from port fees, a fee on trains using the corridor, state and local government commitments of shares of federal surface transportation aid, and local tax revenues. A crucial component of the financing is a \$400 million subordinate loan from the federal government provided by act of Congress. The neighboring ports of Los Angeles and Long Beach are the nation's largest container ports, handling nearly one-third of all containers entering or leaving the United States by water in 1995 (Maritime Administration 1996, 17–18). Rail traffic to and from the ports is projected to triple, to 100 trains per day, by 2020 (Alameda Corridor Transportation Authority n.d.).

Proposals have been made for comprehensive access projects at other U.S. seaports, with aims similar to those of the Alameda Corridor project.

Chicago is a principal intermodal freight transportation hub because it is the interchange between the eastern and western rail systems. At least 18 major facilities load, unload, and transfer intermodal trailers and containers, generating a steady stream of local interchange movements by rail and truck. These facilities generated an estimated 14,200 truck trips per day in 1996. Interchange movements conflict with local traffic and can be an important source of delay in the nationwide intermodal freight network. The Chicago Intermodal Connectors

project is a proposed coordinated package of street and highway improvements intended to facilitate these intermodal connector movements. Thus the project addresses the major established government responsibility for intermodal freight, the highway system, but does not entail intervention into the private-sector relationships among rail carriers and drayage companies, which are also critical for the performance of interchange functions (Smith, Part 2).

International border crossings involve a clear federal responsibility. The highway crossings of the Mexico-U.S. border at Laredo and El Paso, Texas are congested, and customs procedures and state truck inspections add to delay. A complete plan is not in place, but the need for substantial highway and bridge capacity additions together with changes in border processing facilities and procedures is recognized. Meanwhile, the Union Pacific Railroad has invested in yard facilities and improved customs procedures to speed rail freight at the border (Smith, Part 2).

Proposals also have been made for interstate corridor projects, which would involve the federal government, multiple states, local governments, and carriers in coordinated plans to improve long-distance freight corridors. Examples are the Southwest Passage Los Angeles-to-Houston corridor proposal of the Southern California Council of Governments (Smith, Part 2) and proposed north-south Canada-to-Mexico trade routes to handle anticipated traffic growth resulting from the North American Free Trade Agreement (Texas A&M University 1996). Apparently no long-distance freight corridor project has advanced past the preliminary concept stage. Corridor projects are more complex and their goals less well defined than local terminal projects.

Special federal involvement has been proposed in all these examples. Many projects that have national importance are conducted without federal involvement or within established federal programs. State and local governments on their own initiative as well as the private sector have made substantial investments in expanding freight transportation capacity.

Common Features of the Proposals

Most project proposals are defined by their concentration on a freight hub (a seaport, border crossing, airport, or rail interchange point) or freight

corridor. Major hubs and corridors are the logical places to begin a systematic search for additional candidate projects of national significance.

The examples also illustrate that a candidate project of national significance is likely to be far more complex than a straightforward construction project. The proposed projects deal with situations that involve institutional and organizational bottlenecks (like border crossings or Chicago container connections) and multiple jurisdictions. Solutions might not have a single big construction project as the centerpiece.

The qualifications of even the few often-cited examples as true projects of national significance have been controversial, and the small number of such recognized examples suggests that there may not be a large backlog of projects of similar scale, complexity, and nationwide importance. The Alameda Corridor met resistance from some port users and railroads (Burns 1994), and officials of other ports have argued that from a national perspective, there is no shortage of potential port capacity, so the main effect of the Alameda Corridor will be to protect Los Angeles–Long Beach’s market share, a goal of local rather than national significance. In the case of Chicago, the character of the interchange problem may be substantially altered by pending or future rail mergers, and so the appropriate scope of government intervention remains unclear.

Federal involvement in a freight project may be justified in cases where local and national interests diverge. The most frequent such circumstance may be the familiar “NIMBY” (“not in my backyard”) hurdle that most large developments face. Cases of local opposition to projects that are important for the national freight system most often involve small jurisdictions rather than metropolitan areas or states. A small community can suffer severe harm and gain little or no benefit from a major transportation project. For the citizens of a small jurisdiction, all effects may be negative unless there is a way to compensate them. However, at the level of a metropolitan area or state, examples of the local jurisdiction undervaluing a nationally vital project are difficult to find. As noted earlier, all local areas in the United States depend on their “export base,” the goods and services produced locally and marketed nationally or internationally that give the local area the buying power to obtain goods and services not produced locally.

Rather than “NIMBY” problems of local opposition to freight projects of national significance, there is more evidence of the opposite problem, local eagerness to develop projects of questionable value in the

freight marketplace. Sometimes, availability of external aid in the form of tax-exempt bond finance and federal grants can induce local governments to undertake projects that do not efficiently serve freight demand.

Policy Options

Two options for a formal program to identify and carry out projects of national significance are (a) a top-down federal program, under which a federal agency actively identifies, develops, and evaluates projects and (b) a bottom-up approach, under which local governments and private parties develop proposals and seek federal participation. The federal government would assess proposals in terms of their overall likely payoff and the national distribution of net benefits. The bottom-up program could be institutionalized and administered by a federal agency. Such a program could be competitive, as NCIT, in the quotation given earlier, recommends. Some projects would inevitably be considered individually by Congress.

The top-down model may be necessary in a few cases where the primary federal responsibility is established. For most projects, the bottom-up approach has advantages. Projects would depend on the efforts of the immediately affected parties. Experience suggests that local public and private leadership and predominantly local and user funding tend to produce the most successful projects, whereas proposals heavily dependent on federal grants are risky and should be closely scrutinized.

The federal government should require that projects receiving its backing be largely self-financing. All the candidates that have been suggested as projects of national significance would have substantial potential for generating revenues through user fees or other mechanisms (assuming they were successful as transportation projects). The revenue potential reflects the direct private benefits that the projects would generate. These benefits are the major justification for the investments and should be the source of the revenues that pay the costs of the projects.

The federal government's most effective role in such projects would be as a provider of backup credit and as an absorber of risk rather than as a source of grants. Making the payoff to the public investment visible by putting the government contribution on the books of the project as a loan renders the project accountable for its performance and would tend to improve project selection (Petersen, Part 2). Grants and other subsidies that are not justified by documentable external benefits will

lead to overcapacity that reduces the efficiency of the intermodal freight system.

BASIC STRUCTURE OF THE FEDERAL-AID PROGRAM

Decisions that Congress makes on the overall shape of the federal program—its size, the extent of federal control, and the taxes that support it—usually are not driven by considerations of how freight will be affected. However, these decisions have implications for freight transportation.

Size of the Program

The overall size of the federal surface transportation program—the dollars authorized and disbursed for highways and other transportation projects—is the characteristic of the present program with the greatest effect on freight. Highways are the major government responsibility affecting the intermodal freight system. Highway transport accounts for 25 percent of domestic intercity ton miles but 80 percent of the value of freight transportation services in the United States (Wilson 1996, 40, 44), and most intermodal freight movements include a truck leg. Transportation agency studies as well as independent analyses have concluded that opportunities exist for high-payoff improvements in the highway system (Eno Transportation Foundation 1996, 16–18). Any reordering of priorities in state surface transportation capital spending programs in favor of projects important for intermodal freight is far more difficult to achieve in a period of static or declining overall funding, when moving freight-related projects up in priority requires demoting other projects, than it would be in a period of increasing funding.

Extent of Federal Control

When it designs federal surface transportation aid programs, Congress must decide on allocating control of spending between the federal government and the states. The policy options among which Congress can choose are to continue the traditional mechanisms of federal control in the surface transportation program (principally, categorical funding and

allocation of funds among states reflecting national priorities), to make further incremental extensions of state and local flexibility by reducing the number of categorical programs and other restrictions (as ISTEA did), or to fundamentally alter the program so that it simply passes federally collected taxes on to the states with minimal conditions and little or no redistribution. Each of these options has advocates, and each has implications for intermodal freight programs.

When the centerpiece of the federal-aid highway program was the Interstate system, a well-defined national objective, a strong consensus supported federal decisions that redistributed highway fund revenues among the states, set national design standards, and channeled spending into federally defined project categories. With the completion of the Interstates, the program lost this focus. Calls became frequent, especially from certain state governments, for minimizing federal control over spending decisions and federal geographic redistribution. The argument for weakening federal control is that local political and economic forces usually are the most reliable guide to good decisions.

Interests favoring certain program objectives in need of federal support, for example environmental groups and public ports, have urged a continued strong federal role, with funding categories or other strong provisions to influence states to give priority to certain types of projects. The case for continued federal control is that it is necessary in situations where the national interest diverges from local interest. Investments made purely on the basis of local considerations may not address the highest national priorities. Systemwide effects may be difficult to assess from the local perspective and may not carry great weight with local decision makers. For example, local residents might oppose a project of value to the nationwide freight system because of expected negative local spillovers (e.g., congestion, pollution, or unwanted development). Conversely, local groups might support a project (e.g., port improvements to retain traffic) that is not the best solution to the transportation problem from a national perspective for the sake of local economic development.

The goal of system optimization and the decentralized nature of decision making in the U.S. economy and government are not inherently in conflict. If state and local governments have mechanisms for recouping costs of publicly provided facilities through user fees, means are available to compensate parties that bear the spillover costs of development projects, and local governments are not induced by the availability of external aid to undertake uneconomic projects, then local decisions can be

expected to harmonize with national interests. Since these three conditions are not always met, instances of divergence of national and local interests can occur. The significance of this problem is not well documented and needs to be assessed and illustrated with case study analyses.

User Fee Finance

Federal aid for surface transportation improvements is paid for with revenues from the federal motor vehicle fuel tax and other excises on highway users. User fee finance historically has been justified on grounds of fairness. It is also important for the efficient use and development of the highways because it functions as a rough and imperfect pricing mechanism.

The policy options for Congress are to maintain approximately the existing tax structure and user-pays financing principle, weaken the user-pays constraint by allowing more spending on diverse kinds of projects or by discarding trust fund finance, or reinforce the principle by tying fees more closely to the cost of service. The latter two options are not mutually exclusive; user fee reform coupled with increased spending flexibility might improve equity as well as the performance of the freight transportation system.

Use of Highway Trust Fund revenues for nonhighway purposes is a departure from the user-pays tradition. Arguments for and against nonhighway uses were presented earlier in this chapter. One possible justification for such uses is that the existing highway user fee system is highly imperfect. An alternative response to this problem would be to improve the fee system. Several studies have concluded that changes in highway user fees that brought highway user taxes, including truck taxes, more in line with the costs each user generates would have economic benefits (Small et al. 1989; TRB 1996). Prospects for refining freight transportation user fees are examined in Chapter 4.

A final alternative that would allow expanded funding for intermodal freight projects and maintain the user-pays principle would be creation of a multimodal trust fund that would be available for multimodal public works projects and into which users of all freight modes as well as port operators would pay. Such arrangements exist in a few states, and the TRB Committee for Study on Landside Access to Ports recommended in its 1993 report that other states adopt the mechanism

(TRB 1993, 138). No detailed proposal for a federal multimodal trust fund has been made.

REFERENCES

Abbreviations

AAPA	American Association of Port Authorities
DOT	U.S. Department of Transportation
FHWA	Federal Highway Administration
GAO	General Accounting Office
NCIT	National Commission on Intermodal Transportation
TRB	Transportation Research Board

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4



Regulatory and Operations Issues

In addition to building transportation facilities, government in the United States operates and maintains highways, airports, ports, and waterways. Its performance as an operator greatly affects the efficiency of the intermodal freight system. Improved operation can increase the effective capacity of a facility, so better management is a substitute for capital spending. Federal policy recognizes that efficient management complements infrastructure investment. Executive Order 12893 of 1994, “Principles for Federal Infrastructure Investments,” states:

The efficient use of infrastructure depends not only on physical design features, but also on operational practices. To improve these practices, agencies should conduct periodic reviews of the operation and maintenance of existing facilities. . . . Since efficient levels of service can often best be achieved by properly pricing infrastructure, the Federal Government through its direct investment, grants, and regulations should promote consideration of market-based mechanisms for managing infrastructure. (*Federal Register* 1994, 4233)

Freight operations depend critically on communication among shippers, carriers, and receivers. Progress in information technology has been a primary source of productivity growth in the freight industry and has been especially important to the viability of intermodal transport. Information bottlenecks—for example, incomplete implementation of electronic data interchange and lack of standard information requirements among parties in intermodal freight transactions—hinder freight efficiency. Government, as an operator of transportation facilities as well as through its regulatory functions, must be a party to the solution of these information problems.

In addition to building and operating facilities, government regulates many aspects of freight transportation operations. Important categories of regulation that affect intermodal freight are land use (e.g., zoning and wetlands preservation), other environmental rules, truck size and weight, transportation safety, economic regulation of ocean shipping, and antitrust regulation. Government regulates private-sector shippers and carriers, and the federal government regulates the practices of state and local government transportation agencies.

An integrated government policy for improving efficiency of intermodal freight must give at least as much attention to regulatory and operations issues as to infrastructure needs. The major questions for government policy are the following:

- What are the best opportunities for government agencies that operate ports, airports, roads, and waterways to improve the efficiency of these operations?
- Do opportunities exist for process streamlining or other reforms to improve the cost-effectiveness of regulations?
- What is the overall effect of government policies—including antitrust, maritime, and tax regulations as well as government aid programs—on the structure and development of the intermodal freight industries?

This area encompasses an extremely diverse array of laws and government practices. The committee did not examine these issues comprehensively. Rather, it selected three topics that other recent reviews of intermodal policy have not emphasized and that illustrate the

importance of policy decisions on operations and regulation to inter-modal freight efficiency.

The study committee commissioned a background paper, “Information Technology for Freight Transportation Coordination,” by Barrie R. Nault, to assist it in considering one of the topics of this chapter. The paper appears in Part 2 of this volume. The conclusions in this chapter are those of the committee.

FACILITATING APPLICATION OF INFORMATION TECHNOLOGY

Information is an essential complement to freight transport. All freight must be accompanied by information to provide direction to handlers, answer questions of controlling authorities (e.g., customs), and reconcile the records of shippers, consignees, and everyone in between. Freight transportation has benefited from the radical improvements in information technology of recent decades. However, progress in linking the evolving information and transportation systems has been slowed by lack of interoperability, incomplete network infrastructure, and lack of expertise in some sectors that participate in the freight system.

Federal and state governments, in their roles as providers of transportation facilities and services and as regulators, affect the progress of information technology applications in freight transportation. Also, the Department of Defense and some other government agencies are major users of freight services and facilities. Government cannot mandate standards or the use of particular information infrastructure—such efforts have failed repeatedly. Nevertheless, government has a role in facilitating the application of information technology in transportation. It can take a more active lead in ensuring that its systems are interoperable with evolving industry systems and can provide research support for the development of solutions to problems in existing systems.

Government can reduce regulatory compliance costs and at the same time provide an impetus for adoption of information technology by making its regulatory information reporting requirements consistent with industry practice. The U.S. Customs Service’s Automated Commercial System is a successful example. This system, developed under a congressional mandate, permits shippers, carriers, terminal operators,

customs officials, and ports to electronically conduct transactions required for customs clearance, including transmittal of manifests and payment of customs duties. It has been credited with providing an important incentive for adoption of electronic data interchange among all parties engaged in international trade in the United States (Muller 1995, 124–125).

Other experiments with streamlining regulatory reporting requirements in freight transportation through information technology are taking place. A pilot project involving the Environmental Protection Agency and two state governments tested a system to perform the filing of manifests of hazardous waste shipments, required under state laws, via electronic data interchange. State departments of transportation and trucking companies have tested application of automatic electronic identification systems to simplify enforcement activities by reducing the frequency with which trucks are stopped for safety inspections, weighings, and permit checks at border crossings (TRB 1993b, 119, 192–193). However, the full extent of opportunities for reducing regulatory costs through automation remains to be explored.

In some cases, a flexible approach in applying regulations on anti-competitive practices may be advisable to permit industry collaboration on key precompetitive aspects of transport-related information infrastructure. Industry discussions on coordination problems in intermodal freight must take into account constraints imposed by antitrust regulation. Recently, for example, an industry association and a group of shippers' agents have sought Justice Department reviews prior to meetings bringing together railroads, drayage firms, and third parties to discuss equipment interchange problems (*Transport Topics* 1995; Sparkman 1996). The arguments in favor of strictly limiting any such contacts are that any collusion, regardless of motivation, may have the effect of restricting competition to the detriment of consumers and that any regulatory loophole is subject to abuse as a pretext for inhibiting competition.

Effective information management has become an important source of competitive advantage for freight operators, but the essential network nature of the industry requires a degree of cooperation. Government should not prevent industry cooperation on questions of information interchange or other operational matters at the precompetitive level if the cooperation does not restrain competition.

ECONOMIC REGULATION OF CARRIERS

Economic regulation (that is, government oversight of rates and entry into an industry), which ended nearly 20 years ago in trucking and railroads, persists in ocean shipping. Also, international bilateral agreements governing air transport can amount to economic regulation. Efforts toward deregulation have been complicated by the global nature of these industries.

Steamship line common carriers may meet in organizations known as conferences to agree among themselves to fix rates, pool cargo, or establish joint services. Carriers have immunity from U.S. antitrust law for conference activities as long as agreements are filed with the Federal Maritime Commission (FMC). FMC can hold hearings and disapprove the tariffs and other agreements filed with it, but it first must show that the agreements would be harmful. FMC also enforces tariffs and common carriage obligations. These activities are governed by the Shipping Act of 1916, amended most recently by the Shipping Act of 1984, which reaffirmed antitrust immunity for conference rate-setting while giving carriers more flexibility on rates (for example, by allowing carriers and shippers to enter into contracts for rates outside the conference tariff) (Hershman and Kory 1988).

Ports can challenge conference tariffs or other agreements before FMC on grounds that they are discriminatory or unfair. As a recent example, the port of New Orleans complained to FMC in 1995 that conference tariffs were favoring Florida ports and causing it to lose substantial business. The dispute was settled when the conference changed the rates before FMC ruled on the complaint (Mathews 1997, A8). Ports, especially less dominant ones, traditionally have regarded FMC oversight of rates as protection against the propensity of the steamship companies to seek economies by consolidating operations at a smaller number of larger ports.

The magnitude of the influence of conference rate-setting has been disputed. Participating carriers have argued that they are weak cartels because they have no protection from nonconference competition and members can set rates outside the conferences in some circumstances (Mathews 1997, A8). However, the resistance encountered by legislation proposed to alter the system indicates that participants believe the arrangement is important. Studies have made quantitative estimates of

the amount by which conference rate-setting increases shipping rates (Mathews 1997, A1). Shipper conference rate-setting and FMC economic regulation have some effect on shippers' transportation costs, competition among ports, and patterns of freight flows in the United States.

Bills recently introduced in Congress would have substantially modified the existing regulatory system. Unsuccessful legislation in 1996 called for largely deregulated rate-setting while leaving conference antitrust immunity in place. Compromise legislation introduced in 1997 would retain the common carriage obligation and tariff enforcement by the government, but carriers would gain flexibility in setting rates and in acting independently outside conferences (*American Shipper* 1997).

The effort to reform economic regulation of ocean shipping has been led by large shippers and supported by the major ocean carriers. It has been opposed, in general, by port authorities and port workers' labor unions and by some smaller shippers and carriers. Ports, small carriers, and labor fear that deregulation would speed the trend toward consolidation of port operations, threatening smaller ports and their employees. Small shippers believe that confidential contract rate-setting would mean higher rates for them. Regulation is also defended as necessary to balance the market power of the conference rate-setting system (Barnes 1997a). The conferences, in turn, are defended on the grounds that ocean shipping is a global industry, and foreign carriers would go on fixing rates without U.S. government oversight if the antitrust protection were eliminated (Mathews 1997, A1).

Regulations also restrict competition in coastwise shipping. Under the Jones Act of 1920, freight moving between U.S. seaports must be carried in vessels built in the United States and owned and operated by U.S. companies. Although the magnitude of the effect is disputed, the Jones Act curtails to some extent long-distance coastwise trade in the United States. Vessel operators are entitled to federal operating subsidies intended to keep rates competitive, but since the phaseout of the federal shipbuilding subsidy program in the 1980s, U.S.-built ocean-going ships that would qualify for the trade have ceased to be built (TRB 1993a, 63–64; TRB 1992, 54–67).

Reducing coastwise trade restrictions would affect traffic volumes and relative competitive positions of U.S. seaports. Inland freight

movements would be affected by the changes in port market shares and because coastwise shipping competes with rail and truck for entirely domestic freight movements. Some ports could gain traffic as a result of diversion of freight from domestic surface modes.

The Jones Act is supported by the protected carriers and by unions that would be affected by change. It is justified as a means of maintaining U.S.-flag capacity needed for national defense. Shippers who would benefit from more freight options oppose it. Legislation introduced in 1995 and 1997 to modify the act did not succeed (Barnes 1997b). The Transportation Research Board (TRB) Committee for Study on Landside Access to Ports recommended in 1993 that the federal government encourage state projects to promote coastwise shipping as a means of reducing truck traffic between coastal cities (TRB 1993a, 13–14).

The experience of the rail and trucking industries indicates that deregulation has benefits for the public but that industry restructuring stimulated by deregulation can result in losses to some workers, firms, and local areas. So that the economic considerations can be understood, the U.S. Department of Transportation (DOT) should examine how economic regulation of ocean shipping and restrictions on coastal shipping affect intermodal freight performance in the United States and U.S. foreign trade.

PRICING PRACTICES

Setting the fees charged to users of publicly owned transportation facilities is a fundamental operating decision. Improved pricing of government transportation facilities would yield large payoffs in efficiency. There is a great volume of indirect evidence that when prices are unrelated to costs the result is inefficient production and inability of consumers to obtain the goods and services they want. This is shown in comparisons of market economies with socialist economies, and there is no reason to believe that market mechanisms are less important for the performance of individual industries than for the national economy. As an example in the case of freight, it is not disputed that deregulation of the truck and rail industries, which was principally price deregulation, led to large productivity improvements.

Government charges that affect intermodal freight include fees charged by ports and airports to carriers and concessions, and highway and waterway user excise taxes. Chapter 2 of TRB's *Special Report 246* (TRB 1996) describes practical obstacles to marginal cost-based pricing of publicly operated freight transportation facilities and identifies possible means of overcoming these obstacles.

Pricing, in the public or private sector, rations the use of a scarce resource, for example, capacity of a transportation link. Pricing based on marginal cost of each use of a facility encourages beneficial uses of the facility and discourages wasteful uses. The revenue from such fees is also a guide to investment. Generation of revenues in excess of agency operating costs by a facility is a good indication that expansion would be beneficial. It was noted in Chapter 3 that divergence between local and national interests in freight-related infrastructure projects would be reduced if local authorities had better means of capturing some of the benefits of freight system improvements to pay for the costs of the projects. New fee structures, including tolls, would be a way to accomplish this.

Extending the application of user fee finance is one of the principles underlying recent federal surface transportation legislation. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) allowed construction of new toll facilities and conversion of free highways (except Interstates) to tolls with federal-aid funds. A private entity may own the toll facility. ISTEA also established a congestion pricing pilot program. The basis of infrastructure banking, such as the federal pilot program created by the 1995 National Highway System Act, is revenue-generating projects. DOT's *National Freight Transportation Policy Statement* declares:

The prices charged for public sector transportation facilities and services determine whether they are used efficiently. Public facilities costs that are not included in the transportation rates paid by shippers may lead to inefficient use of the Nation's limited transportation resources. Whenever feasible, fees and taxes adequate to cover the cost of building, operating, and maintaining public infrastructure facilities should be recovered from the parties that use and benefit from them. (DOT 1996, 7)

This principle has been endorsed by the states: the American Association of State Highway and Transportation Officials' freight policy states, "Public costs of transportation facilities and services should be recovered through appropriate user charges" (AASHTO 1995).

Despite these endorsements, progress in pricing reform has been slow. An analysis of federal highway, airway, and waterway user charges by the Congressional Budget Office (CBO) and a TRB study of costs of freight transportation have identified opportunities for changes in user fees to improve efficiency.

Concerning highways, CBO concluded:

Although federal taxes on highway users about equal expenditures, changes in fee structure could raise adequate revenue and at the same time promote greater efficiency in highway use. Charges for pavement wear would encourage more efficient truck designs and operating practices. Congestion pricing would stretch existing capacity. (CBO 1992, 8)

TRB's *Special Report 246* recommended that the federal and state governments search for road user fee structures that promote freight transportation efficiency and consumer welfare (TRB 1996, 15).

Port pricing practices and revenue sources resemble those of the private sector more closely than those of other components of government-provided public freight infrastructure. Ports receive revenues from rents paid by terminal operators and from fees levied on ships and cargoes using the port. Fees more than cover costs at some ports, but various forms of government subsidies to ports are common. The availability of subsidies makes competitive undercharging possible and protracts overcapacity (Maritime Administration 1996, 41–44). The recent legal challenge to the harbor-dredging fee imposed by the federal government is described in the section on management of transportation trust funds in Chapter 5 of this report.

Concerning inland waterways, the CBO study concluded that although waterway user charges are well below the average cost of operating the system, the charges are of the same order of magnitude as the marginal cost of operating and maintaining the waterways on uncongested segments. The CBO study suggested options for changes in the fee structure to improve system efficiency or cost recovery, including an

annual license fee, segment-specific fees, and congestion fees (CBO 1992, 62–71).

The TRB study of freight costs also concluded that, aside from congestion costs, waterway user fees are comparable with marginal costs. The study recommended that the U.S. Army Corps of Engineers consider congestion pricing at locks as an alternative or complement to capacity expansion in its planning for the inland waterway system (TRB 1996, 14, 92). Congestion pricing would reduce the economic loss caused by congestion on the existing waterways system, provide a revenue source for expansion, and indicate which components of the system could be expanded most profitably.

User fees on public transportation facilities are almost always controversial. Changes in the structure of fees for highways, inland waterways, and aviation facilities stimulate user opposition. Pilot programs are one approach that may lead to progress in some areas of pricing reform. ISTEA's highway congestion pricing pilot program is an example of this approach. It may be possible in some cases to gain acceptance by demonstrating benefits to users and to the public in a pilot implementation (TRB 1994, 7–12). Provisions to allow users a voice in decisions on how the revenues are spent may also help gain acceptance of changes in fees. An example of such an arrangement is the Inland Waterways Users' Board, created by Congress at the demand of the companies that pay fees for the use of inland waterways, to advise on spending priorities for the inland waterways system.

Road construction, including improvements in access to ports and other intermodal terminals and improvement of through roads, is the most important category of freight-related government infrastructure project in terms of amount of spending and consequences for the freight industries. Road projects are to a great extent user-funded through highway user excise taxes, so some of the benefits of efficient pricing are attained.

Existing highway excise taxes function imperfectly as prices because the amount of excise tax a user pays is only weakly related to the costs that the user generates. The tax a user pays depends on distance traveled (since part of the tax is proportional to fuel consumption) and the weight of the vehicle (because heavy vehicles consume more fuel per mile and pay higher registration fees), but the full costs of a highway trip vary enormously depending on traffic conditions,

roadway design, the characteristics of the vehicle, and many other factors.

Highway user fees more closely related to the time and place of travel would essentially be tolls charged for use of particular roads at particular times. In contrast with user fees in the form of excise taxes, tolls provide an income source for financing particular road projects. Reliance on toll finance imposes a project-level budget constraint that discourages construction of economically unjustifiable projects.

Toll finance of road projects that serve intermodal freight is an option that should always be explored. However, for practical and political reasons, toll finance of highways is not yet widespread in the United States. (One important practical obstacle is that a new toll road generally must compete with untolled parallel routes.) The existing excise tax user fee system may be imperfect as a price mechanism, but it does influence individual user decisions and impose a systemwide budget constraint, and so contributes to efficiency. Therefore, recommendations in this report encouraging user funding are not intended to discourage projects in which highway construction is paid for with highway user excise tax revenues.

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Abbreviations

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CBO	Congressional Budget Office
DOT	U.S. Department of Transportation
TRB	Transportation Research Board

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5



Public Finance of Intermodal Freight Projects

Once a decision has been reached for government participation in a freight infrastructure project (or a category of projects), public officials and private-sector participants must decide on each participant's share of financial responsibility for construction and operation and the revenue sources for the public share.

Finance is sometimes seen as a purely technical matter of putting together a package of loans, grants, and revenue streams to produce a desired end product. However, decisions on responsibility and revenue sources will be critical not only to the feasibility of the project or program but also to its chances for long-term success. Mechanisms established for project finance can help ensure that necessary and valuable projects are built and that government avoids participation in projects with low payoff or little public significance. Decisions on finance are also important from the point of view of equity—they determine, in part, who pays for the project and who receives benefits.

Debates over public involvement in intermodal freight transportation infrastructure stem from two concerns. First, the public sector may

be missing opportunities to accomplish worthwhile projects. Obstacles are alleged to arise because (a) governments do not place proper weight on freight transportation benefits in making up their public works programs, (b) projects fall between the cracks of established program categories, (c) projects would entail nontraditional public-private relationships, and (d) the division of responsibilities among government jurisdictions is not defined.

The second concern is that government may be building or maintaining facilities that are not worthwhile. States are tempted to subsidize their ports and resist market and technological pressures toward port consolidation. Facilities may receive government support on the basis of weakly documented claims of benefits for economic development, the environment, or congestion reduction. Governments recognize that they cannot afford to expend scarce transportation funds on projects that do not yield high payoffs, and government intervention in segments of the transportation enterprise that can be efficiently handled by the private sector is likely to degrade rather than enhance system efficiency.

With hindsight, intermodal freight projects with government involvement generally can be classified into one of three categories:

- Successful, legitimate projects that yield worthwhile benefits, including important public benefits, and for which the government contribution was essential. They may involve a subsidy, or the government may fully recoup its initial outlays through user fees or other revenues. The goal of government finance policy is to ensure that funding is available for these projects.

- Projects that never yield the benefits that were claimed for them when they were undertaken because use projections are not realized or various indirect benefits were forecast speculatively and overoptimistically. Often it is found that the government was the instigator of these projects, federal or other external support was provided, and private-sector participation was weak. These projects harm transportation efficiency by diverting funding from where it is most needed.

- Projects that are justified economically and that probably would have been undertaken in some form and in some location without government involvement, but for which the private sector has extracted subsidies or other concessions from a government to ensure that the investment takes place in its jurisdiction. Local governments are willing to grant concessions to such projects if the alternative is loss of

important development, especially if external sources are available to offset some of the cost. However, from a national point of view these projects may degrade efficiency by misdirecting investment.

Failed projects cannot always be avoided since investment entails risks, and expediency will inevitably determine many local government economic development decisions. The goal is to maximize the number of winners from the standpoint of all affected parties. The rules and principles that govern finance practice can help attain this goal by influencing the likelihood that good projects will be accomplished and bad projects will not.

The two important links between finance and performance are the rules governing the granting of subsidies and the extent of reliance on user fees. It was noted in Chapter 2 that government involvement does not necessarily imply subsidy. Public participation in a completely user-fee-financed project might be necessary because government already owns some of the facilities involved (e.g., roads or ports), government can act as an honest broker among numerous participants, or exercise of eminent domain is justified. Projects relying on user fees as the predominant revenue source, having strong private-sector participation and risk sharing, and having government contributions that include substantial local funds are more likely to be winners for public and private participants and from a national as well as a local perspective. On the other hand, availability of subsidies can contribute to overcapacity and retard adjustments to market forces.

The committee considered selected finance issues where it believed opportunities exist for improving the performance of the freight system through better public finance practices. The first two sections of this chapter address policy issues that are relevant to state and local governments deciding on finance arrangements for individual projects:

- Who should pay for a project, and
- Innovative finance mechanisms.

The following four sections deal with policy questions relevant to the federal government, which influences project finance decisions through its aid programs and tax laws. The federal issues are

- Management of the federal transportation trust funds,
- Rules for tax-exempt bond finance,

- The relation of federal tax and aid policies to privatization, and
- Project finance and interstate economic development competition.

The study committee commissioned a background paper, "Public-Sector Financing in Intermodal Freight Transportation," by John E. Petersen. Basic policy principles as well as practical financing mechanisms are examined in the paper. The paper is published in Part 2 of this report.

WHO SHOULD PAY FOR THE PROJECT

A government planning an intermodal freight project must devise a finance package that apportions the cost burden among participants and others. The candidates for paying for an intermodal freight transportation project are users (through tolls or other fees), other direct beneficiaries (e.g., owners of property adjacent to the development), the local public (through subsidies from local general tax revenues or tax concessions), the national public (through use of federal grants or tax-exempt bond finance), or indirect beneficiaries (e.g., application of road user fee revenues to rail transport on the grounds that rail use relieves road congestion).

How a choice should be made from among these options was discussed in Chapter 2. As argued in that chapter, the decision on who will pay for a project is important from the standpoint of fairness and because it will affect the probability that the project will be successful (that is, that the project will improve intermodal freight efficiency).

The predominant benefit of most projects in which the government participates is the direct benefit to users. Such projects should be financed by user fees or private-sector contributions, with each user paying a fee commensurate with the cost of providing service to that user. In some projects, external benefits such as pollution reduction or mitigation of highway congestion are an important part of the justification for government participation. In these projects each user ought to pay the net cost of its use of the service after deducting the public benefit, and government should make up the difference between revenues from users and project costs. If the intended external benefit is primarily local development, local government should provide the subsidy.

Local government choices on project funding sources are constrained. As a practical matter, any external funds available (for exam-

ple, federal aid) for which the locality has no higher-priority application must be used. Also, local governments may feel compelled to make compromises for the sake of job retention.

Communities that lie along the route of a major national freight corridor (for example, towns along railroad main lines and major port cities) bear environmental costs from this activity, including noise, air pollution, and traffic delays and accident risks caused by rail-highway grade crossings. It may be argued that this burden is unfair because the economic benefit of the freight traffic is distributed nationwide whereas the environmental costs are disproportionately local. In certain circumstances, the local community can capture some of the national benefit as recompense for the local costs. For example, one of the principal intended benefits of the Alameda Corridor port access project in Southern California is to eliminate 200 grade crossings in the Los Angeles area (Preusch 1997). The project will be paid for in part by a per-train fee paid by railroads for use of the new grade-separated rail line.

In other circumstances there may be no feasible mechanism for local governments to charge a tax or fee to compensate for local costs. In such cases a national subsidy to the local area to mitigate the effects might be regarded as justified on equity grounds, even when the benefits of mitigation are entirely local. The Congestion Mitigation and Air Quality program of the Intermodal Surface Transportation Efficiency Act of 1991 provides federal grants for projects to improve local air quality. In the absence of a mechanism to charge polluters for their contributions to local emissions, this aid may be regarded as essential for equity.

Whatever funding mechanisms and sources are chosen for a proposed project, the review of the proposal should include an assessment of the implications of funding for the burden of costs and a justification for the distribution of the burden. The public requires a clear accounting of cost burdens to judge the cost. Such an accounting often is difficult in complex finance packages that include loan guarantees and tax-exempt bond finance.

INNOVATIVE MECHANISMS FOR RAISING CAPITAL AND OPERATING FUNDS

Most state and local government funding of transportation facilities serving freight is for road construction. The traditional means of

financing most state road projects has been pay-as-you-go, with funds derived from the federal-aid highway program grants and from a state highway fund that receives revenues from the state fuel excise tax. For highway projects, the term “innovative finance” refers to any arrangements that depart from these practices, including use of debt finance, use of new revenue sources, and public-private partnerships—joint development by the government and the private sector of projects serving joint public and private ends—to increase funds available for transportation infrastructure and accelerate completion of projects.

Innovative finance received an impetus from the National Highway System Act of 1995, which authorized a pilot program to create State Infrastructure Banks (SIBs). A SIB is best understood not as a distinct funding mechanism, but as a necessary structure to facilitate or institutionalize the various innovative finance techniques. The pilot SIBs are to be capitalized with a portion of participating states’ federal-aid funds or with a share of a special \$150 million appropriation Congress made in 1997 to get the program started. States can also choose to leverage federal capital by using it as collateral against which to raise additional funds through bond issuance (GAO 1996, 3).

SIBs can offer loans (generally at below-market rates) or loan guarantees to local governments or private entities for undertaking certain kinds of transportation infrastructure projects. Loans are to be repaid to the SIB with revenues derived from the project, dedicated taxes, or general government revenues. Among state applications for the pilot program, freight-related projects proposed included highways, the Alameda Corridor port access project, and a truck-rail intermodal terminal. Revenue sources for repayment of loans included highway toll receipts, state transportation funds, special taxes from a tax-increment financing district, associated real estate development, and lease payments from private operators of publicly owned facilities (GAO 1996, Appendix 3).

SIBs and similar innovative finance techniques have the potential for increasing and accelerating funding of transportation projects by providing attractive financing terms for private-sector partners, providing for debt finance of local government projects that otherwise would probably be financed only on a pay-as-you-go basis, stimulating development of revenue sources like special tax districts and tolls, and providing a structure and models for public-private joint development.

The planned construction of a 27-km (17-mi) segment of Virginia Route 288, although it is not primarily a project to serve freight, illustrates the application of innovative finance techniques. The project was conceived before enactment of the SIB program, although it was designated as a potential recipient of a SIB loan in the state's application to the SIB pilot program (GAO 1996, Appendix 3). An agreement between the state and a private firm calls for the firm to finance, design, and construct the road. The state will then receive ownership, and the firm will operate the road as a franchise. The project will be financed with private debt and equity in combination with public funds. Tolls collected with an automatic toll collection system will be the principal revenue source for debt service. The public contribution is expected to include a tax collected from nearby landowners through creation of special tax districts. The project would not have been possible before 1995 state legislation sanctioning public-private transportation development (*American City and County* 1996). This case shows how private-sector participation, underused revenue sources like tolls and special tax districts, and a combination of federal, state, and local government support can be brought together to accelerate completion of worthwhile transportation projects.

The General Accounting Office's (GAO's) review of the SIB pilot program identified potential barriers to the use of the SIB mechanism. Among them are the limited number of available projects that can be expected to generate revenues through user fees or dedicated taxes, conflicts with federal tax-exempt finance rules for public-private projects receiving funding from a SIB capitalized with state bond proceeds, and state laws restricting joint public-private ventures (GAO 1996, 13–18).

The success of SIBs will depend on the extent to which institutional obstacles now hinder local government access to capital markets or local government utilization of project-level revenue sources in financing transportation improvements. Conclusive evidence that such barriers are blocking substantial numbers of high-payoff projects does not exist. Congress and the states will need objective and detailed assessments of whether the pilot SIBs succeeded in expanding funding available for transportation infrastructure, the sources of such additional funding, and the success of the projects funded through SIBs.

The important policy choice facing Congress, the states, and the U.S. Department of Transportation, once the results of the pilot SIB

program have been assessed, is whether and how to promote further use of infrastructure banks and similar innovative finance arrangements. The options the federal government will consider include further promoting innovative finance through increased direct federal capitalization of SIBs and relaxation of tax-exempt bond finance restrictions to promote public-private partnerships. States must decide whether to change their laws to remove legal barriers to public-private joint development (as Virginia did in the case described earlier) and whether to participate in the federal infrastructure banking program.

MANAGEMENT OF TRANSPORTATION TRUST FUNDS

The federal government maintains four transportation trust funds that finance facilities serving intermodal freight: for highways, harbor dredging, inland waterways, and airports and airways. Many states maintain similar trust funds for highways. The trust funds are accounting entities that receive revenue from excise taxes targeted to users of public transportation facilities. Their disbursements are ostensibly restricted to purposes benefiting users. Trust fund finance is seen by its supporters as under assault today from a combination of congressional actions to divert revenues from their traditional purposes and Congress's propensity to allow balances to accumulate by restraining spending below revenues.

The principal policy issues regarding federal trust funds include the relationship between fund revenues and expenditures, allowable categories of expenditures, and the underlying questions of whether trust funds are desirable mechanisms for transportation infrastructure finance and whether their use should be expanded or curtailed. The policy options for Congress are as follows:

- Preserve and reinforce the mechanism as trust fund defenders advocate, by spending down balances and curtailing diversions;
- Maintain the status quo under which a major portion of spending is for the direct benefit of user fee payers but revenues are also used for other purposes, including budget-balancing; and
- Abolish the trust funds. Abolishment would not necessarily entail abolishing user fees.

The most common arguments in favor of trust fund finance are funding stability and fairness. However, as discussed in the section on use of Highway Trust Fund revenues in Chapter 3, the mechanism may also promote efficient use of facilities and efficient investment because it is an approximate form of pricing. Projects can be financed through user fees without maintenance of a trust fund, but the trust fund feature probably makes pricing for public services more politically acceptable than if user fees were treated as general revenues.

The federal trust funds all carry unspent balances. There is no economic reason why receipts should equal expenditures in every time period. However, the existence of an unspent balance tends to undermine political support for the funding mechanism. Some industry groups and state governments have opposed allowing trust fund balances to accumulate. For example, a National Council of State Governments report advocates congressional action to permanently and automatically distribute all Highway Trust Fund revenues each year (National Governors' Association 1997).

The argument against trust funds is that the mechanism creates an undesirable constraint on public investment decisions, since users defend their claim to the funds.

The federal harbor maintenance trust fund faces a special difficulty. Revenues to the fund are from a charge proportional to cargo value on imports and exports through U.S. seaports. Disbursements pay for Army Corps of Engineers harbor dredging. Federal courts recently declared the charge unconstitutional because export duties are specifically forbidden in the Constitution. The court decision noted the weak connection between collections and expenditures at particular ports as part of its rationale for rejecting the government's argument that the charge is a user fee rather than a duty (*American Shipper* 1997). Congress has the options of restructuring the fee so that revenues are closely related to costs or abandoning user fee finance of harbor dredging.

RULES FOR USE OF TAX-EXEMPT BOND FINANCE

The sale of bonds by local governments, the interest on which is exempt from federal income tax, is an important financing component of many local public works projects. Federal tax law sets the rules for

the kinds of activities eligible for tax-exempt bond finance. Today a bond may be tax exempt only if no more than 10 percent of the proceeds are used for private purposes, as defined by federal regulations, and no more than 10 percent of payments to bondholders derives from private sources. Lending of tax-exempt bond proceeds by the issuing government to a private entity is also tightly restricted. Finally, federally guaranteed bonds are ineligible for tax-exempt status.

Bonds whose proceeds are used for certain specified types of facilities are exempt from these limits. Exempt facilities include airports, docks, and wharves, but other kinds of facilities that might be involved in a public-private intermodal project are not exempt (GAO 1996, 19).

Proposals have been made for altering the rules for tax-exempt bond finance to make it easier for public-private transportation projects to qualify. Federal legislation was considered in 1997 that would create a pilot program to permit tax-exempt bond finance of highway projects with major private participation and that would be transferred ultimately to public ownership (*AASHTO Journal* 1997). The Presidential Infrastructure Commission in 1992 recommended creation of Public Benefit Bonds that would not be subject to current private activity restrictions and that could be used to finance infrastructure projects (Petersen, Part 2).

GAO identified the private involvement limits on tax-exempt debt as an important potential inhibition on the utility of the SIBs that were created by the National Highway System Act of 1995, because these banks were intended to be capitalized in part with proceeds from state-issued tax-exempt bonds (GAO 1996, 19). GAO did not recommend that rules be changed on this account, but the implication of the report is that Congress will need to examine the rules if it wants the infrastructure bank program to grow.

Relaxing restrictions on tax-exempt bond finance would encourage development of new funding sources for transportation projects by attracting private-sector participation in projects that serve both public and private ends. However, greatly expanding tax-exempt bond finance could have some negative consequences:

- Tax-exempt bond finance does not reduce the cost of a project to the public as a whole. Rather, it redistributes the cost. Tax-exempt bonds have the same effect as a subsidy from all federal taxpayers to the

beneficiaries of the project financed with the bonds. If the public benefits that justify the subsidy are primarily local or regional, use of the federal subsidy might be regarded as inequitable.

- The subsidy affects the overall efficiency of the economy, since it biases the capital market in favor of certain government-selected investments. The diversion of capital may be good or bad depending on whether the favored projects generate public benefits sufficient to justify public support.

- If tax-exempt finance is liberally available for a class of projects, the tendency will be for it to be used indiscriminately rather than selectively, and projects without it will not be built. This pattern has emerged in the case of professional sports stadiums—nearly all stadiums built in recent years have received some kind of tax-exempt financing (Ward 1996).

It is because of such concerns that Congress enacted the existing limits on the use of tax-exempt bonds. Legislation has been introduced to further tighten the rules for some uses (e.g., stadiums) (Ward 1996). However, if Congress wishes to promote innovative finance and public-private partnerships, some reduction of differences in the tax treatment of publicly and privately financed infrastructure may be necessary.

RELATION OF FEDERAL TAX AND AID POLICIES TO PRIVATIZATION

Several states are experimenting with forms of private-sector road development, and existing ports and airports, which are beginning to be privatized in other countries, may come to be seen as candidates for privatization here. Federal-aid program and tax rules will strongly affect the feasibility of privatization. Tax-exempt bond rules require any facility that has been publicly owned to retire any tax-exempt bonds outstanding if it is sold or transferred to private use (Petersen, Part 2). Also, a private-sector facility that competed with public facilities would be handicapped by lack of access to tax-exempt finance and to other forms of federal aid that public facilities can tap. The policy option to be considered concerning this issue is whether, for some categories of facilities, tax and aid program rules ought to be neutral with respect to whether the facility is in public or private hands. Neutrality could be accomplished by allowing

access to aid under some circumstances for certain private facilities or restricting aid to public facilities.

PROJECT FINANCE AND INTERSTATE COMPETITION FOR ECONOMIC DEVELOPMENT

One of the ways that decisions about finance mechanisms affect intermodal freight transportation efficiency is through the effect of finance arrangements on interstate rivalry for business at ports and other transportation hubs. For the sake of economic development and to retain local jobs, states sometimes compete in offering various incentives to carriers and shippers to use facilities within their boundaries. For example, a state may feel obligated to offer assistance to a railroad serving a port because a neighboring state offered similar assistance.

On the whole, competition among jurisdictions in the United States in providing residents with services and economic opportunities probably improves the efficiency of government and increases the ability of citizens to obtain the level of public services they want and are willing to pay for. However, interstate economic rivalry will be detrimental to national freight system efficiency if it leads to subsidized overcapacity. Proposals for controlling these rivalries have included the following:

- Interstate cooperation: Multistate agreements could be made to share information about economic development programs, use common analysis methods, and adopt uniform standards and measures of accountability.
- Disclosure: Government offers, especially in direct competitions for an industry relocation decision, should be made public during the bidding.
- Standards: States should set standards for what constitutes a development prospect worth offering incentives to obtain. Standards would be concerned, for example, with quality of jobs and their availability to the local population, performance monitoring, and enforcement mechanisms.
- Program evaluation: The costs and benefits of development incentives should be measured and evaluated retrospectively. Such evaluations would have to follow established methods and standards and use data reported according to uniform procedures (Eberts, Part 2).

A 1996 Maritime Administration report observes that public sea-ports could improve their revenues through collusion:

The economic costs of following price/service competition ultimately may force the port industry to reexamine these practices. By exploring the potential benefits of regional cooperation within the context of the antitrust immunity which they are allowed by statute, public ports may realize both substantial savings and improved profitability, while improving their competitive standing nationally and internationally. (Maritime Administration 1996, 44)

Of course, a port cartel could have negative consequences for inter-modal freight efficiency, shippers, and consumers. Overcapacity could be supported by monopoly pricing, and ports might become less responsive to shipper and carrier service requirements. The positive aspect of such an arrangement would be that ports would become more self-supporting and the need for subsidies would be lessened. The ideal solution from the standpoint of freight efficiency probably would be for ports to compete without recourse to subsidies.

Federal regulations and programs affect the costs borne by state and local governments in offering development incentives to firms. For example, the rules of the federal surface transportation aid programs determine what kinds of projects can be funded with federal aid, and federal law determines what activities are eligible for tax-exempt government bond financing. Tightening restrictions on the use of federal funds and tax-exempt bonds will curtail state economic development assistance and interstate rivalry, whereas liberalizing the rules will expand state efforts.

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Abbreviation

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6



Summary, Conclusions, and Recommendations

The Transportation Research Board's Committee for a Study of Policy Options To Address Intermodal Freight Transportation has examined prospects for changes in government programs to improve the efficiency of freight transportation in the light of recent experience with these government programs. This chapter is a summary of the policy options the committee identified and the committee's findings and recommendations.

INTERMODAL FREIGHT POLICY ISSUES

In the past two decades, the freight transportation industry has been transformed by technological, market, and organizational change. By one estimate, productivity gains in logistics and freight transportation have been reducing costs at the rate of \$20 billion each year in U.S. business. Freight transportation is a joint enterprise of the private sector, government, and public enterprises (for example, public port authorities). Private firms pro-

vide direct services to shippers, but public enterprises and government provide major components of the infrastructure. It is important to review government programs that serve freight to determine how well they are keeping up with rapid change in industry.

Federal surface transportation programs enacted in 1991 and 1995 contained important steps toward a new government approach to the freight sector, including provisions to raise the priority of projects serving freight, allow more flexibility in using federal funds for freight projects, and make way for new forms of public-private ventures. Also in this period, state and local governments and public port and airport authorities have initiated a variety of freight development initiatives, often in partnership with the private sector.

Intermodal freight transportation is any movement of goods that involves two or more modes of transport, including transport of goods in containers that can be moved on land by rail or truck and on water by ship or barge; bulk commodity shipments that involve transfers between modes; and air freight, which always involves truck movements to and from the airport. Improving the efficiency of intermodal freight has been a prominent public- and private-sector concern for several reasons. Intermodal freight is critical in international trade, in transport of many high value-added products, and in military supply; it has been a source of trucking industry cost savings and rail industry revenue growth; and intermodal transfers, which often require coordination of government entities and multiple private-sector firms, can be physical and organizational bottlenecks affecting the performance of the entire freight system.

Intermodalism is one of the elements of the wave of technological change affecting logistics, the management of movements and inventories of materials and products in manufacturing and distribution. Redesigning logistics lowers costs in industry by reducing inventory and by allowing suppliers to respond more quickly and precisely to changes in demand and technology. Intermodalism is one more option increasing flexibility for shippers and offering opportunities for cost savings, and it is a foremost case of the value of coordination in the logistics process. The success of intermodalism depends on information technology, which has allowed carriers to manage intermodal movements through multiple handlings by several parties.

The growth of intermodal freight has been a private-sector development. However, federal, state, and local governments have shown increasing interest in facilitating intermodal freight. Intermodalism is seen by the public sector as a means to ends considerably more diverse than simply improving freight transportation efficiency. Primary motivations more often are controlling highway agency costs by reducing truck traffic, reducing highway congestion, reducing pollution, and stimulating local employment through terminal developments.

These motivations are legitimate responsibilities of government; however, in this study, the committee has taken the perspective that the essential criterion for judging public-sector freight transportation programs should be their effect on the efficiency of freight transportation and business logistics. Projects that enhance freight productivity will have the greatest chance of success in attaining other public goals. Such projects will be well used by carriers, will be viable for the long term, will generate the strongest stimulus for local economies, and will provide the greatest opportunities for reduction of pollution, congestion, and accidents. Policies driven by consideration of systemwide efficiency may, however, yield losers as well as winners, as less efficient facilities or firms lose business to more efficient ones, and decision makers must recognize these consequences.

This study has examined public policy issues at the federal government level and issues that confront state and local governments. The committee selected topics to complement and update several past reviews of intermodal policy, including that of the National Commission on Intermodal Transportation.

The committee has limited its conclusions on particular policy questions to identification of the leading alternatives for addressing perceived problems or capitalizing on opportunities. Decisions on these questions involve compromises among competing interests, and assessments depend on whether the perspective is federal, state, or local. Selecting the best option will be a matter of political debate, analysis, and experimentation.

The committee has made recommendations in the more general areas of principles for government involvement, the framework for evaluating projects and programs, and research needs. **Committee recommendations appear in this chapter in bold type.**

The committee's conclusions are in four areas:

- Principles for government involvement,
- Federal surface transportation programs and freight,
- Regulatory and operations issues, and
- Public financing of intermodal freight projects.

Identified research needs are grouped at the end of this chapter.

PRINCIPLES FOR GOVERNMENT INVOLVEMENT

Government builds and operates parts of the infrastructure for freight transportation, collects user fees and general tax revenues to finance public facilities, and imposes social and economic regulation on the freight industries. Governments today are reexamining the scope of their involvement in freight transportation. They are investing in facilities not traditionally provided by the public sector (for example, intermodal freight terminals) and entering into new kinds of arrangements with the private sector in the finance, construction, and operation of facilities. At the same time, governments are considering proposals for transferring some traditionally public transportation facilities and functions to private-sector operation. The committee has made recommendations on three issues related to the government's role: criteria for government involvement, deciding whether government involvement should include a subsidy, and analysis tools and methods.

Government investment decisions concerning freight-related facilities are complex and involve a balance of competing economic and political interests. Local government decisions give economic development considerations great weight and often hinge on the availability of external funds. National decision making encompasses a broader set of concerns for economic efficiency and equity. No step-by-step procedure or technique of rational analysis can be used mechanically to prescribe the correct course of action in every case. Nonetheless, clear guidelines and systematically developed information will be of value in the political process of reaching decisions.

Deciding on Government Involvement

Government officials responsible for infrastructure ought to define a list of criteria for involvement as general rules or principles to follow. Specifications concerning how the government will quantitatively test whether a proposal meets each of the criteria should accompany the statement of principles.

To evaluate a possible public investment or an incentive or subsidy to encourage a private-sector investment, the government should

- First, determine that the investment would be worthwhile (i.e., that its benefits probably would exceed the costs and that it would have a higher payoff than alternative investments), and
- Second, determine that the private sector would not undertake the investment on its own.

What kind of freight infrastructure project will yield benefits and yet cannot attract sufficient private-sector support? Such a project, in addition to fulfilling a private-sector demand, must meet one or more of the following five criteria:

- The project will reduce external costs of transportation. An external cost is a cost imposed on others through a mechanism other than a market price, for example, air pollution.
- The project will yield external economic development benefits: transportation infrastructure improvements may, in special circumstances, yield efficiencies beyond those recognized by individual private-sector participants.
- The project or program is an intervention to redress the market imbalance caused by subsidies to some category of carrier.
- The project fulfills a government responsibility for defense or public safety.
- The project falls within the established government responsibility for major parts of the transportation infrastructure.

If government involvement cannot be justified on one of these grounds, the project belongs in the private sector.

Subsidized Versus Unsubsidized Participation

Government participation in a freight project does not necessarily mean subsidy of the project. A critical part of the decision on public involvement is deciding between subsidized and unsubsidized participation. **To justify a wholly or partially subsidized project, the government should demonstrate a clear welfare gain (usually from correcting a market failure) as grounds for intervention.** Most commonly in the case of intermodal projects, the alleged market failure is the potential for external benefits of the kinds given in the preceding list (or avoidance of external costs). **The justification ought to be supported by quantitative estimates of the value of external benefits.**

A critical approach by public officials to proposals for public-private developments in which the public sector carries a major cost burden or risk is essential if public-private partnerships are to remain viable means of infrastructure finance for the long term. Projects that fail to live up to their promises will undermine public and private willingness to support future partnerships. Subsidized freight intermodal projects have risks that ought to be taken into account in their evaluation:

- Projections of external benefits are highly uncertain, and experts differ on methods and definitions.
- The willingness of users to pay for an unsubsidized project proves that benefits exceed costs; therefore the risk that resources are being used inefficiently is greater if the project is subsidized.
- The subsidy is a transfer from nonusers to users of the subsidized facility that may be inequitable.
- Government-imposed solutions to intermodal freight problems may supersede preferable solutions that the private sector would reach without intervention.
- If a publicly backed project becomes obsolete or turns out to have been a poor decision, it may prove politically difficult for the parties to cut their losses.
- Programs intended to be targeted incentives have a tendency to become routine over time and so lose their effect.

The rationale for government involvement in a project that pays its own way depends on the established responsibilities and special compe-

tencies of government. A project may be entirely self-supporting from user fees and private-sector participant contributions, yet government involvement might be necessary to broker a cooperative solution, to solve problems of dealing with multiple jurisdictions, because use of eminent domain is justified, or because existing public facilities are involved.

Analysis Tools

Governments should apply standard methods for evaluating infrastructure investment proposals. The methods might be analogous to financial accounting standards. Methods are needed that would allow governments to evaluate forecasts of demand, modal diversion, and effects on congestion and pollution. **Of equal importance, the financial and economic performance of completed projects should be systematically evaluated according to established guidelines.** With honest evaluation of past projects, the public sector can learn from experience and improve the performance of its infrastructure investments.

State and local governments often have not applied a systematic benefit-cost framework to evaluating intermodal freight public-private partnerships. Their evaluations reveal uncertainty about how to assess novel kinds of projects according to diverse goals and criteria. The effects on employment and government finances, which are central to conventional state and local government evaluations, are relevant to government decisions and should be estimated. However, evaluation of a transportation improvement ought to start with assessment of transportation benefits.

The appropriate framework for evaluating intermodal freight project proposals is to concentrate on quantifying and valuing their direct effects as transportation projects: changes in shipper total logistics costs, changes in external costs such as pollution and congestion, and effects on the location of economic activity. This evaluation does not require government collection of proprietary cost data. Rather, the necessary analysis is a market forecast, that is, a forecast of demand for the new facility at various levels of service and user charges. The primary utility of standardized evaluation procedures is to provide a structure for rational analysis and a factual basis for public discussion of government decisions rather than a single bottom-line evaluation of net benefits or costs.

Guidelines for Determining the Scope of Public-Sector Participation

The guidelines proposed here synthesize consideration of the key issues into a checklist for organizing the information needed to evaluate public-sector and public-private proposals for intermodal freight infrastructure projects. They are suggested as a starting point for local jurisdictions to develop their own guidelines. Any such formal evaluation procedure would complement the essentially political process of public debate and discussion that is the basis of major public works investment decisions. The seven steps of the procedure are as follows. Each is explained in Chapter 2.

Step 1. Ask questions about the market for the proposed intermodal freight facility.

Step 2. Determine the existence of external benefits generated by the facility.

Step 3. Estimate economic development benefits.

Step 4. Compare the project with the payoff from alternative uses of the public resources and with alternative means of attaining the intended benefits.

Step 5. Examine who would receive benefits and bear costs.

Step 6. Determine whether a subsidy is necessary, which level of government ought to provide the subsidy, and the mechanism of finance.

Step 7. Follow up. Compare the actual results of projects with the projections.

FEDERAL SURFACE TRANSPORTATION PROGRAMS AND FREIGHT

The federal surface transportation program governed for the past 6 years by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) affects the performance and development of intermodal freight transportation in the United States. The program distributes funds to the states for highway construction and other transportation purposes. The committee examined how this program has served the needs of freight and considered options for provisions of federal programs aimed at improving intermodal freight efficiency.

Use of Highway Trust Fund Revenues for Nonhighway Freight Projects

ISTEA strictly limited the kinds of projects that could receive federal-aid funding in keeping with the traditional federal program structure: funding by highway user taxes and projects benefiting highway users. The policy options open to Congress are to significantly expand state flexibility to conduct nonhighway projects with federal surface transportation aid funds, leave limitations similar to those in ISTEA in place, or roll back project eligibility rules to prevent spending for nonhighway freight-related projects.

The argument in favor of flexibility is that it would allow states and local governments to plan and develop their transportation infrastructure in a manner that maximizes the highway component's contribution to the overall system. In some cases the solution to a highway congestion problem is not more highway investment, but rather improved functioning of other components of the system, for example, improved interfaces between highways and other modes. Limiting use of Highway Trust Fund revenues to highway-only projects denies local decision makers, who are responsible for the effective operation of the transportation system, the power to make the most sensible use of transportation resources.

The argument against greatly increasing state and local government flexibility to use Highway Trust Fund revenues for nonhighway freight projects has several dimensions. One is the violation of the user-pays principle. Although the user-pays principle is very imperfectly implemented in the existing trust fund structure, further erosion of the principle would be unwise, and any increased flexibility should be tailored to avoid such an outcome. Another possible negative consequence of increased flexibility would be escalation of uneconomic interstate rivalries. Any changes in flexibility should be designed to limit the tendency of states or local governments to seek funding for projects that become redundant. Finally, increased flexibility could encourage private-sector transportation companies to demand more public funding for their infrastructure projects. Added flexibility should be designed as a way to improve effectiveness and efficiency in public investment and not as a license for public support of private projects.

Project Selection and Priority for Freight Projects

Freight interests have stated that, in their experience, the provisions of ISTEA emphasizing flexibility and local participation in project selection have sometimes come into conflict with the goal of improving intermodal freight efficiency. Proposals have been made for federal actions to influence local decisions on project priorities or to raise the priority of freight-related projects. Although federal program rules exert an important influence on local decisions, problems concerning project selection priorities require local solutions. Policies aimed at increasing the involvement of freight interests in the public project selection process rather than at restricting local responsibility appear more promising.

Obstacles to better local investment decisions concerning freight include the lack of planning procedures that identify projects that would yield high freight-related payoffs, the problems of coordinating multiple jurisdictions in the conduct of regional projects, and lack of well-established public-private relationships in planning freight-related projects. Experience with ISTEA suggests that some local areas and freight interests are learning to overcome these problems.

A more fundamental obstacle to effective local decision making can occur if there is a mismatch between the jurisdiction of the decision-making authority and the regions or populations that will receive the benefits and bear the costs of a transportation development. This problem is addressed in the following section.

Projects of National Significance

Both the National Commission on Intermodal Transportation and the U.S. Department of Transportation (DOT) freight policy statement refer to a category of projects of national significance as a sphere of federal responsibility. A project of national significance may be defined as a freight project that has important consequences for the performance of the nationwide freight system. State and local governments and private firms often carry out such projects without need of federal leadership. A project of national significance that entails a federal responsibility is one for which government involvement is justified and that state and local governments are unable or unsuited to

carry out because the national interest differs from the local, because of the scale of the project, or because essential federal responsibilities are involved (e.g., customs).

A formal program to identify and carry out projects of national significance requiring government participation might be organized as a “top-down” federal program, with a federal agency actively identifying, developing, and evaluating projects. The top-down model may be necessary in a few cases. However, for most candidate projects of national significance, the appropriate model would be a “bottom-up” approach in which local governments and private parties develop proposals and seek federal government participation in them. Projects would depend on the efforts of the immediately affected parties. The federal government should require that such projects be largely self-financing; the most effective federal role would be as a provider of backup credit and as an absorber of risk, not as a source of grants. Experience suggests that local public and private leadership and predominantly local and user funding is the formula that tends to produce the most successful projects. Proposals heavily dependent on federal grants are risky and should be closely scrutinized. (It should be understood that projects that are primarily highway construction funded from highway-user excise taxes are essentially user funded.) The bottom-up program could be institutionalized and administered by a federal agency.

The goal of system optimization and the decentralized nature of decision making in the U.S. economy and government do not inherently conflict, although sometimes they conflict in practice. Such conflicts can be lessened, and local decisions can be expected to harmonize with national interests, if state and local governments have mechanisms for recouping costs of publicly provided facilities through user fees, means are available to compensate parties that bear the spillover costs of development projects, and local governments are not induced by the availability of external aid to undertake uneconomic projects. Federal policy should seek to bring about these conditions.

Overall Structure and Size of the Federal-Aid Program

Decisions that Congress makes on the overall shape of the federal program usually are not driven by considerations of how freight will be

affected; however, these decisions have implications for freight transportation. The key decisions are total funding; the extent of federal control, as exerted through program category funding and interstate redistribution; and the structure of user taxes supporting the program.

The overall size of the federal surface transportation program—the dollars authorized and disbursed for highways and other transportation projects—is the characteristic of the present program with the greatest effect on freight. Highways are the major government responsibility affecting the intermodal freight system. Resources sufficient to maintain adequate highway system performance are essential for intermodal freight efficiency. Reordering of priorities in state surface transportation capital spending programs in favor of projects important for intermodal freight will be far more difficult to achieve in a period of static or declining funding.

REGULATORY AND OPERATIONS ISSUES

In addition to building transportation facilities, government operates highways, ports, airports, and waterways. Its performance as an operator affects the efficiency of the intermodal freight system. Operation entails maintenance, fees and pricing, rules and procedures, labor relations, and communication with users. The public enterprises that manage ports and airports commonly function as landlords rather than as operators of their facilities; that is, operations are conducted by private-sector tenants.

Important categories of regulation that affect intermodal freight are land use (e.g., zoning and wetlands preservation), other environmental rules, truck size and weight, transportation safety, maritime regulation, and antitrust regulation.

This area includes an extremely diverse array of laws and government practices. The committee selected three topics that other recent reviews of intermodal policy have not emphasized and that illustrate the importance of regulatory and operations issues for intermodal performance.

Facilitating Application of Information Technology

Information is an essential complement to freight transport. All freight must be accompanied by information to provide direction to handlers;

answer the questions of controlling authorities (e.g., customs); and reconcile the records of shippers, consignees, and everyone in between. Freight transportation has benefited from the radical improvements in information technology of recent decades. However, progress in linking the evolving information and transportation systems has been slowed by lack of interoperability, incomplete network infrastructure, and shortage of skills.

There is an important federal role in facilitating the application of information technology in transportation. Government cannot mandate standards or the use of particular infrastructure—such efforts have failed repeatedly. Nevertheless, government can provide research support for the development of solutions to problems in the current systems. Also, as a major participant in the overall transportation system, **government should take an active lead by ensuring that its systems in areas such as customs, enforcement, and military logistics are interoperable with evolving industry systems. In some cases, flexibility in applying regulations on anticompetitive practices may be advisable to permit industry collaboration on key precompetitive aspects of transport-related information infrastructure.**

Economic Regulation of Freight Transportation

Ocean carriers engaged in scheduled service have antitrust immunity under U.S. law to form shipping conferences to set uniform rates. Rates and practices are overseen by the Federal Maritime Commission. Federal regulations also restrict competition in coastwise shipping. The regulations and shipper conference rate-setting affect competition among ports. Rate restrictions may prevent carriers from offering different rates to different ports on the same coast or quickly changing rates to respond to changing demands on vessels and terminals. The arguments in favor of regulation are that ocean shipping is a strategic industry for the economy and defense, deregulation would result in greater dependence on foreign carriers, regulation preserves U.S. maritime jobs, and regulation provides a degree of stability in a volatile market.

The experience of the rail and trucking industries shows that deregulation can have benefits for the public. So that the trade-offs among strategic and economic considerations can be understood, **DOT should examine how economic regulation of ocean and coastal**

shipping affects freight transportation and efficient use of the U.S. port system.

Rates and market access in international air cargo transport also are controlled to some extent by international agreements and conference rate-setting. The consequences of these practices for the performance of the air cargo system should be understood.

Pricing Practices

Among the most important decisions that governments make as operators of transportation facilities is how to charge their customers. Government charges that affect intermodal freight include highway and waterway user excise taxes and fees charged by ports and airports to carriers and concessions. Improved pricing of government transportation facilities would yield large payoffs in improved efficiency. Improved pricing means charging each user fees and taxes that more closely match the costs (including net external costs) of providing service to that user.

PUBLIC FINANCE OF INTERMODAL FREIGHT PROJECTS

Decisions on financial responsibility and revenue sources will be critical not only to the feasibility of a public-sector intermodal freight project but also to its chances for long-term success. Mechanisms established for project finance can help ensure that necessary and valuable projects are built and that government avoids participation in projects with low payoff or little public significance. The committee has examined the following selected policy issues that are relevant to state and local governments deciding on finance arrangements of individual projects or to the federal government, which influences project finance decisions through its aid programs and tax laws.

Who Should Pay for the Project

The candidates for paying for a public-sector intermodal freight transportation project are users (through tolls or other fees), other direct beneficiaries (e.g., owners of property adjacent to the development), the

local public (through subsidies from local general tax revenues or tax concessions), the national public (through use of federal grants or tax-exempt bond finance), or a category of indirect beneficiaries (e.g., applying road user fee revenues to rail transport on the grounds that rail use relieves road congestion).

The predominant benefit of most projects in which the government participates is the direct benefit to users. **Such projects should be financed by user fees or private-sector contributions, with each user paying a fee commensurate with the cost of providing service to that user.** In some projects, external benefits (such as pollution reduction or mitigation of highway congestion) or defense needs are an important part of the justification for government participation. **In these projects each user ought to pay the net cost of its use of the service after deducting the public benefit, and government should make up the difference between revenues from users and project costs.** If the intended external benefits are primarily local development, local government should provide the subsidy.

Road construction to improve access to ports and other intermodal terminals is one of the most important categories of freight-related government infrastructure projects. Road projects are to a great extent funded by users through highway user excise taxes, so they at least partially meet the criteria proposed here.

Practical constraints on local governments may dictate departures from this ideal assignment of responsibility. Local governments will not allow any external funds available (for example, federal aid) to go unused and may feel compelled to make compromises for the sake of job retention.

The Congestion Mitigation and Air Quality (CMAQ) program of ISTEA provides federal grants for projects to improve local air quality. In the absence of a mechanism to charge polluters for their contributions to local emissions, such aid may be regarded as essential for equity.

The review of the project proposal should assess the implications of the funding package for the incidence of cost burdens.

Innovative Mechanisms for Raising Capital and Operating Funds

The term “innovative finance” refers to any funding arrangements that depart from traditional practices for a category of public works. Greater reliance on debt finance, use of new revenue sources (e.g., tolls and spe-

cial tax districts), and public-private partnerships can increase funds available for transportation infrastructure and speed completion of projects. Congress in 1995 authorized a pilot program to create State Infrastructure Banks (SIBs) to facilitate the various innovative finance techniques. Potential obstacles to the use of innovative finance mechanisms include the limited number of projects that can be expected to generate their own revenues, conflicts with federal tax-exempt finance rules, and state laws restricting public-private ventures.

The important policy choice facing Congress and the states is whether to promote further use of infrastructure banks and similar innovative finance arrangements. The options the federal government will consider include further promoting innovative finance through increased direct federal capitalization of SIBs and relaxation of tax-exempt bond finance restrictions to promote public-private partnerships. States must decide whether to change their laws to remove any legal barriers to public-private joint development and whether to participate in the federal infrastructure banking program.

Management of Transportation Trust Funds

Trust funds are accounting entities that receive revenue from excise taxes paid by users of a public facility and whose disbursements are ostensibly restricted to purposes benefiting users. Because of extensions in the kinds of uses to which the funds may be put and caps imposed on spending, the federal transportation trust funds function differently today than when they were conceived. The policy options for Congress are to

- Preserve and reinforce the traditional mechanism by spending down balances and curtailing diversions;
- Maintain the status quo, under which a major portion of spending is for the direct benefit of user fee payers but revenues are also used for other purposes or retained;
- Create multimodal trust funds into which users of all freight modes would pay and that would be available for multimodal public works projects; or

- Abolish the trust funds. (This would not necessarily entail abolishing user fees.)

States that use trust fund finance face similar policy choices.

The most common arguments in favor of trust fund finance are funding stability and fairness. The mechanism may also promote efficient use and development of facilities because it makes pricing for public services more politically acceptable. The argument against trust funds is that the mechanism creates an undesirable constraint on public investment decisions. There is no economic reason why the optimum level of investment in a category of facilities should necessarily always equal user fee revenues.

Rules for Use of Tax-Exempt Bond Finance

Proposals have been made for altering the rules for tax-exempt bond finance to make it easier for public-private transportation projects to qualify. Relaxing restrictions would encourage development of new funding sources for transportation projects by attracting private-sector participation in projects that serve both public and private ends. However, greatly expanding tax-exempt bond finance could have negative consequences:

- Tax-exempt bonds have the same effect as a subsidy from all federal taxpayers to the beneficiaries of the project. If the public benefits are primarily local or regional, the subsidy might be regarded as inequitable.
- Tax-exempt bonds bias the capital market in favor of government-selected investments. The cost of this diversion is justified only if favored projects generate sufficient public benefits.
- Expanded use might increase the frequency of defaults and raise the cost of borrowing for all users of tax-exempt finance.
- If tax-exempt finance is liberally available for a class of projects, the tendency will be for it to be used routinely.

Congress faces the choice of maintaining existing restrictions, which are designed to avoid these risks, or expanding eligibility. If Congress decides to promote innovative finance and public-private partnerships, some reduction of differences in the tax treatment of publicly and privately financed infrastructure may be necessary.

Relation of Federal Tax and Aid Policies to Privatization

Federal tax and program eligibility rules also will affect the feasibility of privatization. States are experimenting with private-sector road development, and ports and airports may become candidates for privatization. The policy option to be considered by Congress is whether, for some categories of facilities, tax and aid program rules ought to be neutral with respect to whether the facility is in public or private hands. Neutrality could be accomplished by allowing access to aid under some circumstances for certain private facilities or by restricting aid to public facilities.

RESEARCH NEEDS

The research needs identified by the committee relate to developing, testing, and demonstrating methods for obtaining the information required for decisions on public-sector intermodal freight programs and to evaluating current programs. Needs related to each of the four areas of the committee's conclusions are given in the remainder of this chapter. **The committee recommends that the federal government undertake research on the following topics.** The topics are of importance to states as well.

Principles for Government Involvement

The federal government, cooperatively with the states and metropolitan planning organizations, should develop standard methods for evaluating freight infrastructure investment proposals. Methods should be consistent with Executive Order 12893, "Principles for Federal Infrastructure Investments." Federal mandatory standards are not necessary or practical; rather the federal role should be to demonstrate the utility of the methods. Methods should include means for conducting benchmark comparisons of freight facility performance with actual state-of-the-art facilities.

The Federal Railroad Administration's RAILDEC analysis package is an example of such a procedure. Standardized analysis procedures must be supported (*a*) with retrospective evaluations of projects to compare

actual outcomes against those predicted or assumed in the prospective analysis and (b) with comparisons of estimates of social costs in the evaluation procedure against estimates from other sources and from new research.

The federal government needs to maintain existing data programs that collect freight activity data and ensure that these programs are compatible with the requirements of local and regional transportation planning.

The possibility that freight infrastructure improvements may yield economic benefits in the form of network externalities or reorganization benefits that cannot be measured by observing the direct transportation cost savings produced by the project remains a poorly understood aspect of transportation project evaluation. Research is needed to clarify the relevance of such benefits in evaluations.

Federal Surface Transportation Programs and Freight

Research is needed to define, measure, and forecast national freight system performance. Examples of important topics in the area are projection of long-term capacity constraints, examination of institutional obstacles to improved performance, and establishment of benchmarks for national and international comparisons of freight system productivity. The most practical way to study these topics will be through targeted research that involves screening for exceptional cases that are then studied in depth, rather than through new comprehensive data collection programs.

New federal initiatives affecting freight should incorporate formal program evaluation. For example, the CMAQ and SIB programs should undergo evaluation. The government needs to systematically track how the new and experimental programs are used and document successes and failures.

Regulatory and Operations Issues

Policy research is needed to examine how the efficiency of information exchange throughout the freight system is affected by federal practices

and requirements, including information exchange requirements imposed by regulation, information exchange practices between the federal government and its suppliers, and federal antitrust oversight of private standards-setting activities. The research must look across government organizational boundaries.

Research on international port and airport privatization that examines effects on shipper costs, trade, and local employment would help in evaluating U.S. policy. Analysis of effects of economic regulations on ocean shipping should be conducted, following the model of evaluations of rail and trucking regulation.

Study is needed on whether programmatic efficiencies could be gained through reorganization of the U.S. Department of Transportation along lines that would parallel commercial realities in intermodal freight and passenger transportation.

Public Finance of Intermodal Freight Projects

Research is needed on the costs and distributional effects of alternative financing mechanisms for public works projects, including tax-exempt bond finance, user fees, and use of federal aid. Case studies examining the relationship of finance to performance of public intermodal projects are needed.

Study Committee

Biographical

Information

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PART 2

Commissioned Papers

Principles for Government Involvement in Freight Infrastructure

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for Employment Research

The Committee for a Study of Policy Options To Address Intermodal Freight Transportation of the Transportation Research Board has been charged with providing guidelines for determining government's role in freight-related activities. The committee has been asked to consider several questions:

- What circumstances (e.g., market inefficiencies, equity concerns, or historical institutional patterns) justify or necessitate government involvement?
- Will optimizing the freight system require centralized decision making (e.g., arbitration of interstate rivalries), or conversely, will existing, decentralized decision making suffice?
- How can federal responsibilities be distinguished from those of state and local government?
- What practical analysis tools do governments need to evaluate individual proposals for government involvement in projects for developing freight facilities?

A conceptual framework to aid the committee in addressing these questions is provided in this paper. Intermodal freight operations are defined and illustrations of existing facilities are offered. Potential benefits of intermodal freight facilities are set forth. Barriers to the effective implementation and operation of intermodal freight facilities are discussed. Reasons for government involvement, including market failures and externalities, are introduced. The relationship between regional economic development, intermodal freight activity, and government involvement is described. Finally, the appropriate roles of the various levels of government are examined.

INTERMODAL FREIGHT ACTIVITY

Intermodal freight activity is any shipment of goods that involves two or more modes of transportation during a single journey. Various combinations of modes are used to ship goods: trucks, railroads, ships and barges, and aircraft. Consequently, intermodal freight activity requires terminals for intermodal transfers and appropriate highway, rail, waterway, and runway access to link these facilities to the national transportation network.

The most common intermodal activity, with respect to tons shipped, is the combination of rail and water transport. According to the 1993 *Commodity Flow Survey*, 42 percent of all U. S. domestic tonnage shipped intermodally was shipped by a combination of rail and water, whereas 36 percent was shipped by truck and water. When measured in ton miles, the ranking stays the same but the percentage increases for the rail-water combination from 42 to 46 and decreases for the truck-water combination from 36 to 27. The truck-rail combination stands at 21 percent for tons and 25 percent for ton miles. Intermodal freight shipments are used predominantly for long-distance hauls. Intermodal shipments are at least twice as long as single-mode shipments. Multimodal shipments involving trucks averaged 2250 km (1,400 mi) in 1993; single-mode shipments by for-hire truck averaged 760 km (470 mi) and by rail averaged 1230 km (770 mi) (Bureau of Transportation Statistics and Bureau of the Census 1996, Table 1).

Intermodal freight activity is still a small portion of total freight activity, according to statistics from the *Commodity Flow Survey*. In

1993, 2 percent of the 8.7 billion t (9.6 billion tons) transported that year was shipped intermodally. When measured in ton miles, the percentage is higher (6 percent). Nonetheless, intermodal freight shipments are considered beneficial to the national economy, and increased attention has been focused on how to expand the nation's intermodal capacity.

To illustrate the steps involved in intermodal shipments, consider the movement of a container from a domestic producer to a foreign destination. In this case, the shipment involves trucks, railroad flatcars, and containerized ships. A typical intermodal arrangement begins with the assembly of products to be loaded into the container. The products may come from a single location or may be collected from several locations by small trucks or vans and taken to a trucking terminal, where they are loaded into a container. The container is hoisted onto chassis and transported by truck to a truck-rail intermodal terminal, where it is transferred to either a double-stack or single-stack train, depending on the distance shipped and the terminal facilities. Once assembled, the train, which will probably include other types of cars, embarks for the port. At the port facilities, the shipload is assembled from this and other trains and trucks while awaiting the arrival of the containership. En route, information concerning the containers and their contents is sent to the shipping company's agents at the arrival port, and steps are initiated for customs clearance. Carriers are notified of the number and type of railroad cars needed to ship the incoming containers and the expected arrival time of the containership. Receivers are also notified. On the ship's arrival, containers are off-loaded directly onto an awaiting train or onto chassis and trucked to their destinations (DOT 1995).

The example highlights several facts about intermodal freight activity that are important in understanding the appropriate roles of government and the private sector. First, intermodal freight activity improves the efficiency of shipments by combining existing modes of transportation. The efficiency occurs through the optimal use of existing modal capacity. Second, because intermodal freight activity connects publicly provided transportation systems, such as highways and water navigation improvements, with privately provided systems such as rail, it involves from the start a public-private partnership. Third, the construction of intermodal facilities, such as seaport facilities, entails large fixed costs, which may give the facility the status of a natural monopoly and thus has

implications for the pricing of services.¹ Fourth, the efficient operation of intermodal freight facilities requires a high degree of coordination among modes and the efficient flow of information across modes.²

Two intermodal facilities illustrate these characteristics and provide a basis for motivating the discussion on government involvement. The Alliance International Tradeport, located in the Dallas–Fort Worth area, is a hub for rail, truck, and air freight transport. Although it is a successful enterprise, local governments have provided substantial financial support. To attract a maintenance facility of a large airline to the tradeport, the Alliance Airport Authority, a government entity, issued up to \$800 million in tax-exempt special facility revenue bonds. The city of Fort Worth financed \$10.7 million in street, utility, and runway improvements, and the state approved a 15-year abatement of personal and real property taxes. Jet fuel charges were waived, and airline inventories were exempted from taxation (W. E. Upjohn Institute for Employment Research 1995).

Another example is Rickenbacker International Airport in Columbus, Ohio. The tradeport is considered one of the most successful truck–air cargo facilities in the nation. Nine air cargo carriers average at least 65 arrivals per week. In 1994, the airport handled more than 215 million kg (475 million lb) of air cargo, employing nearly 5,000 individuals. Even with this success, the airport has not broken even, nor is it expected to do so in the near term. The county currently subsidizes airport operations by \$3.5 million to \$4.0 million per year (W. E. Upjohn Institute for Employment Research 1995).

¹ Scherer defines natural monopolies as occurring when the minimum optimal scale of production is so large that there is room in a given market for only one or at most a very few firms to realize production and distribution economies of scale (Scherer 1970, 520). He gives the example of railroading, which he says has the tendency toward natural monopoly because of the indivisibility of the right-of-way and the coordination difficulty of having more than one carrier use a given set of tracks. Intermodal facilities appear to have some of the same characteristics, if one considers the entire system connecting the facility to the highway or rail network, among other factors. The question is ultimately an empirical one. Given the limited number of locations suitable for ports, the land requirements to accommodate the large equipment and mooring requirements, and the linkages to the rest of the transportation system, it appears questionable whether these facilities could be divided into small, replicable units and still achieve the lowest unit costs.

² The National Commission on Public Works Improvement (Revis and Tarnoff 1987, i) states that an efficient and seamless transfer of goods between modes requires the simultaneous and successful implementation of several key components: integrated and coordinated infrastructure, integrated and standardized facilities and equipment, coordinated communication, coordinated management and administration, coordinated paperwork (documentation), and clarity of liability responsibility.

These two examples illustrate the current role of government in intermodal activities and the private-public partnerships that have been established. In both cases, government has provided infrastructure improvements, directly financed construction costs, and subsidized operating expenses. The purpose of this paper is to arrive at a set of principles and guidelines to assess the role of government in intermodal activities.

BENEFITS OF INTERMODAL FREIGHT ACTIVITY

Understanding the type and magnitude of benefits generated from intermodal freight activity is critical for determining whether intermodal freight facilities and activities should be the responsibility of the private sector or government. The National Commission on Intermodal Transportation, in its final report to Congress, listed several types of benefits that may accrue from an efficient national intermodal transportation system (National Commission on Intermodal Transportation 1994, 3). The commission considered all intermodal transportation, including passenger, but the list presented here includes only the benefits that are most likely to result from intermodal freight activity:

- Lowering overall transportation costs by allowing each mode to be used for the portion of the trip to which it is best suited;
- Increasing economic productivity and efficiency, thereby enhancing the nation's global competitiveness;
- Reducing congestion and the burden on overstressed infrastructure components;
- Generating higher returns from public and private infrastructure investments; and
- Reducing energy consumption and contributing to improved air quality and environmental conditions.

The commission's list combines direct benefits, such as the reduction in transportation costs, congestion, and pollution, with secondary or resulting benefits, such as enhanced competition and higher returns, which may be confusing when considering the distinct consequences of intermodalism. Nonetheless, the list is helpful in thinking about the

benefits accruing from intermodalism. The importance of freight transportation to national defense should also be mentioned, since an efficient transportation system is necessary for troop and ordnance deployment and the efficient production of materials used for national defense. This list, with the addition of national defense, will be used in this paper to establish principles for determining the extent of government involvement in intermodal freight activity.

BARRIERS TO DEVELOPMENT OF AN INTERMODAL FREIGHT SYSTEM

Whereas intermodal freight activities account for only 2 percent of the volume of shipments, intermodal activity is predicted to grow substantially in the next few years if barriers to the development of intermodal facilities are overcome. Many intermodal facilities report increased congestion not only within their facilities but also on access routes to the facility. A study contracted by the Federal Highway Administration (DOT 1995, 1–12) cited the following impediments to the expansion of intermodal facilities:

- Lack of adequate infrastructure,
- Congestion,
- Operational inefficiencies,
- Financial limitations, and
- Institutional relationships.

Behind these impediments are complex issues of planning, coordination of the various modes, financing, and environmental and land use regulations, to name a few. It is not simply the issue of whether the private sector or the government should take sole responsibility for intermodal freight activity. The private sector has taken the lead in intermodal development, and partnerships between the two sectors have already been formed. Rather, the question is whether the government needs to modify its established transportation programs to further accommodate and enhance the private sector's move toward intermodalism as the demand for less costly, more efficient freight shipments increases.

PRINCIPLES OF GOVERNMENT INVOLVEMENT IN ECONOMIC ACTIVITY

The principles and suggested guidelines posited in this paper are based on the concept of market failure. This principle assumes that markets are the most efficient means of allocating resources to economic activities. Consequently, economic transactions, including investment in capital projects, are best performed by individuals acting in their own self-interest within a market that is unconstrained by government regulation or other impediments that may distort prices or otherwise alter behavior. Therefore, *market failure* is the failure of private markets to achieve an efficient allocation of resources. One well-accepted role of government is to correct market failures. However, in establishing this framework for considering the role of government in intermodal freight facilities, it must be recognized that what we will propose is only a second-best solution. Given the deeply rooted institutional arrangements for the public provision of highways, ports, and air facilities, it is impossible to start from scratch and redo the entire system to comply with market principles. Nonetheless, market failure provides guidelines with which to gauge the appropriateness of future transportation infrastructure investment decisions.

At least three types of market failure can be associated with intermodal freight activity. The first type relates to market failures associated with the large fixed cost incurred in constructing the facility and to the inability of marginal cost pricing to cover the costs of building and operating the facility. The second type has to do with externalities directly generated by the facility, such as the likelihood that intermodalism will reduce traffic congestion and air pollution and create network externalities. In addition, the contribution of intermodal freight activity to national defense is considered an external benefit. The third type calls for government intervention, in the form of an infrastructure project, to correct perceived market failures of high unemployment and low economic activity within specific regional economies. This type is similar to the second in that it generates externalities, but the two types of externalities are differentiated, because the third type frames intermodal freight activity as a means to an end that is not directly related to transportation, that is, to boost the overall local economy. Other

government-sponsored projects could achieve the same purpose and may be more effective in doing so.

Therefore, the appropriate role of government depends not only on the characteristics of the intermodal transportation facilities themselves, but also on freight-related activities as a potential tool for local economic development. That is, guidelines should include ways to counter factors that impede the private sector from investing efficiently in intermodal facilities (if indeed market failures do exist) as well as reasons why government subsidies to private partners in intermodal activities or government management of intermodal transportation systems may be an effective tool for pursuing economic development strategies. The extent of government involvement in freight-related activities is determined by a host of factors, including the nature of the activities, the type and magnitude of market and nonmarket benefits resulting from intermodal freight activities, cost characteristics, and the economic condition of the local economy in which the activity is located.

INTERMODAL FREIGHT ACTIVITY AS PRIVATELY PROVIDED

Intermodal freight activity combines existing modes of freight transportation to use these modes efficiently. The ability to cross between modes allows shippers to utilize the comparative advantages of the different modes. For example, trucks are generally less expensive than rail for shorter distances, typically those less than 1600 km (1,000 mi). Over longer distances, rail service, especially double-stack container flatcars, is less expensive than trucking. Trucking also offers special services for some types of shipments, such as more flexible departure and arrival times, better reliability, and better tracking, which may render trucking more cost-effective for some type of commodities regardless of the distance (DOT 1995, 1–18). Morlok et al. (1996) provide several examples of intermodal freight shipments being less costly than single modes.

Because intermodal freight activities enhance modal efficiency, they lower transportation costs for all users of the transportation net-

work.³ These direct benefits are reflected in the prices paid for transportation services, and when businesses operate in a competitive market these lower costs are passed along to customers as lower prices. Shippers have incentives to use the freight facility and thus pay for the services offered, because they can cut costs and, in the case of some commodities, can offer special services because they can combine modes with different attributes, such as more frequent deliveries, on-time departures, and greater reliability. Consequently, intermodal terminal owners can reap the benefits of their investment through the market system. Indeed, most rail and truck intermodal terminals and facilities are privately owned and operated, so the private sector has taken primary responsibility for the terminal component of the intermodal freight system (DOT 1995).

FAILURE OF MARKETS TO INVEST OPTIMALLY IN INTERMODAL FACILITIES

A private entity decides to invest in a facility if the internal rate of return on the project is greater than the market rate of interest. Why should government intervene in facility investment when private businesses provide it more efficiently? First, consider private market impediments to building and operating an intermodal freight facility. Government intervention may be justified because of the nature of the facility, particularly its large size, and in the case of intermodal systems because of the need to coordinate various activities and parties and to obtain strategic rights-of-way.

Thus, governments, at various levels, become involved in the construction and operation of intermodal facilities

- Through direct financing of all or part of the intermodal project or providing the transportation system to the facility,
- As a fiscal agent that can use its creditworthiness and tax-exempt status to secure loans for the facility,

³ Morlok et al. (1996) demonstrate that the amount of savings due to intermodal freight activities depends on the proximity of the business to the intermodal freight facility.

- As a taxing agent to collect revenues that otherwise would not be available to the facility through the pricing of services,
- As an agent that coordinates the activities of various parties to bring the project to fruition, and
- As an entity that can exercise eminent domain to obtain strategic properties necessary for the efficient operation of the facility.

Natural Monopoly

Some intermodal facilities tend to be natural monopolies because of their locational advantage or because of the large fixed costs of constructing the facilities. Examples include the nation's half-dozen or so major seaports. A natural monopoly may also occur where major modal systems intersect, such as the facilities recently constructed at the Alliance International Tradeport outside Fort Worth, Texas. In addition to the air freight operations, a large truck-rail intermodal facility has been completed there. In these and other cases, the size of the facility more than likely causes the average cost of building and operating the facility to decline over the entire feasible range of operation. When this occurs, the marginal cost is below the average cost, and setting price equal to marginal cost will not cover the total cost of the facility. Railroading is a classic example of a natural monopoly. The indivisibility of the right-of-way and the coordination problems of having more than one carrier use a given set of tracks lead to efficiencies if only one carrier provides the services (Scherer 1970, 520). Similarly, it is more efficient to build and operate one large terminal than to construct several smaller ones near each other.

One difficulty with a large facility is the pricing of services. Unless price equals average cost, the facility will not collect sufficient revenues to cover the cost of construction and operation and to enjoy a normal rate of return. No investor would find this type of project attractive. One option is for government to regulate the facility. Most natural monopolies, such as electric utilities, are regulated in one form or another by the government and must gain approval by regulatory bodies for rate changes.

Another option is for natural monopolies to follow the marginal cost pricing rule but to allow the government to subsidize the monopolies' chronic deficit out of tax revenues. Consider the following hypo-

thetical example in which the taxing authority of a city helps a private entity collect revenue to finance the construction and operation of an intermodal freight facility. A railroad seeks to construct an intermodal facility next to an industrial park for exclusive use by industrial park businesses. The industrial park is owned and operated by the government of a midsize city. The facility consists of a rail siding, a large loading dock, warehouses, and an access road to the nearby Interstate highway. The cost of constructing the facility is sizable. The railroad plans to finance the facility by charging users a fee. Since it is easy to control access and use of the facility, the railroad does not foresee any problem in collecting a fee that covers the marginal cost of providing shipping services.

However, because the initial construction cost of the facility is so large, the railroad cannot charge users their marginal cost of using the facility and break even. (The marginal cost is below the average cost at the optimal level of use of the facility.) To cover costs, the railroad proposes a two-tier pricing system in which a fixed charge and a variable price (equal to the marginal cost) are imposed. Since most users are willing to pay more than the marginal price because of the cost advantage they gain from using the facility, the fixed component of the two-tier price can be charged (up to the value of their consumer surplus). Since only businesses within the industrial park will use the facility and the industrial park is owned by the city, the city agrees to collect the fixed component of the two-part price. *In this case, a private entity seeks a government subsidy to build an intermodal freight facility to cover the cost of the facility and extract part of the customer's consumer surplus.*

An approach that does not necessarily involve government directly is for the facility to practice price discrimination among its customers. Electric utilities engage in price discrimination among different types of users, such as residential and commercial customers. Industrial buyers, who typically purchase large quantities of electricity, often receive more favorable rates than residential customers. Electric utilities even discriminate among users from the same sector, charging higher rates for those who use electricity during peak-demand times. Rail companies and motor carriers may charge rates according to what the traffic will bear. Shippers of high-value commodities have historically paid higher rates, relative to marginal transportation costs, than those shipping lower-value commodities (Scherer 1970, 522–523).

Inefficiencies of Government Funding

It has long been recognized that raising funds through government taxation exacts a cost on society by distorting business and household behavior. For example, income taxes discourage income-producing activities, sales taxes reduce consumer spending, and capital gains taxation may discourage investment. Government revenue bonds also distort economic behavior. By offering lower interest rates, they may crowd out privately financed projects. When local governments raise revenue through these and other taxes by imposing higher rates than found in neighboring jurisdictions, there is an additional incentive for businesses and households to move from the high- to the low-tax areas, further distorting economic behavior. Research has produced many estimates of the excess burden of taxation. Most estimates of the marginal excess burden of raising a dollar of public funds through taxation fall between \$1 (no excess burden) and \$1.50 (50 percent more than the revenue raised). However, there are instances in which the marginal excess burden may be less than \$1. These circumstances involve assumptions about the labor supply curve and are beyond the scope of this discussion. However, one should simply be aware that the cost of raising revenue through taxation distorts economic behavior and that the net burden may exceed the actual amount raised through taxation (Ballard and Fullerton 1992, 117–131).

Whereas there is no consensus about the magnitude of the excess burden, the possibility that government financing of intermodal freight activities may entail costs beyond the amount raised should be taken into consideration. For instance, in the extreme case in which the excess burden is \$0.50, one must weigh the likelihood that externalities will exceed 150 percent of the contribution of the public sector in financing the intermodal facility. If the value of the externalities is below this amount, the cost of government financing will exceed any benefits being taken into account. Suppose that the annual operating budget of an intermodal facility is \$100 million and the government contributes \$10 million each year from general revenue funds. If in the extreme case this costs society an additional \$5 million each year, the annual value of the external benefits of the facility should exceed \$15 million. External benefits would then need to amount to more than 15 percent of the annual operating budget of the intermodal facility. If the

government contributes more than 10 percent of the annual operating budget, the externalities would need to be a larger percentage of the total operating budget to justify its involvement.

Coordination of Modal Operations

Intermodal freight facilities also require the coordination and integration of rail, truck, and water transport modes. Private information may not be sufficient to bring private agents together to make the transaction. Imperfect information can cause market failure by preventing awareness of market transactions that have net benefits (Bartik 1990, 362). The long-standing practice among freight carriers of operating within their respective modes of transport has impeded the formation within the transportation industry, broadly defined, of mechanisms to coordinate access to intermodal freight facilities and the flow of communication between modes during operation. The government has exacerbated the problem by structuring regulations and guidelines to perpetuate the separation of modes. A minimal involvement of government would be to eliminate the regulations that impede communication between modes. Another level of involvement would be to facilitate the establishment of standards necessary to ensure proper communication and coordination.

EXTERNALITIES AS JUSTIFICATION FOR GOVERNMENT INTERVENTION

From the perspective of the broader community, such as a regional economy, the commercial profitability decision criterion may not reflect the extent of the benefits or costs associated with the intermodal freight facility. Thus, the investment decision may not be optimal. By ignoring external benefits, the private sector would invest in fewer intermodal freight facilities than would be socially optimal. Conversely, by neglecting the negative externalities, the private sector would over-invest in intermodal facilities.

Externalities, or external benefits and costs, occur when the actions of one economic agent affect the environment of another agent other than through prices (Varian 1984, 259). Markets typically ignore exter-

nalities, so market-determined prices (and thus costs) do not incorporate these effects. One reason why markets do not internalize externalities is the lack of a market for a commodity. For instance, there is no market for pollution, and thus there is no market-determined price (or cost) for polluting. The same is true of highway congestion. Vehicles that add to congestion and contribute to a highway environment that impedes traffic flow are not charged for use of the highway in accordance with their effect on other drivers. It may also be that there is no market mechanism for parties who directly benefit from their proximity to a transportation facility to compensate the owner of that facility. Businesses benefit from their proximity to Interstate interchanges, but they do not directly pay the government units that financed and constructed the Interstate. Therefore, one appropriate role for government is to establish mechanisms for businesses to take externalities into account, such as through taxes or subsidies.

In considering the benefits or costs of intermodal facilities, it is important to determine which effects are already reflected in prices and thus internalized in the markets and which are not reflected in prices. To make this distinction, the former are referred to as internal benefits (costs) and the latter as external benefits (costs).

Consider the hypothetical example of the same intermodal facility as introduced earlier, but this time consider the fact that the intermodal freight facility generates externalities. The railroad plans to build an intermodal freight facility next to an industrial park and recognizes that the benefits of the intermodal facility extend beyond the customers who directly use it. The facility makes the industrial park more attractive to businesses who use rail and trucks to ship their commodities. The added attractiveness of the area raises property values, and the railroad would like to extract some of these rents to help finance the construction and operation of the facility. It indicates to the city that it will not be able to go ahead with the project unless it receives a subsidy. The city agrees to the subsidy and increases the property taxes of businesses in the industrial park on the basis of higher land values. *In this case, the intermodal facility is constructed by a private party aided by a subsidy from the city that equals the benefits to the businesses in the industrial park.*

Most of the benefits listed by the National Commission on Intermodal Transportation (1994, 3) involve externalities, although there is no way to determine the relative size of the externalities. Empirical

research on the benefits of freight transportation does not offer estimates of the benefits and costs with sufficient precision to be of much help in making these decisions. Yet it is useful to go through the list of benefits offered by the National Commission on Intermodal Transportation to determine which are direct or internal benefits and which are indirect or external benefits.

It should be noted that benefits do not always fall neatly into these two distinct categories. In Table 1, benefits are classified as internal or external depending on their predominant effects. Of course, an economic activity initiated in the private sector *prima facie* generates internal benefits, otherwise the action would not be undertaken. Some actions generate additional benefits to other parties. When private activities clearly yield external benefits of significant magnitude, both categories are checked in the table. However, external benefits generated from one item may be listed under another item. The first two benefits given in the table illustrate this possibility.

The first benefit in the table, lowering transportation costs, generates both internal and external benefits. With respect to internal bene-

TABLE 1 Classification of Internal and External Benefits from Intermodal Freight Activities

BENEFITS	INTERNAL	EXTERNAL
Lowering overall transportation costs	✓	
Increasing national and regional economic productivity and efficiency		✓
Multiplier effects from building and operating freight facilities		✓
Reducing congestion and the burden on overstressed infrastructure		✓
Generating higher returns	✓	
Reducing energy consumption and contributing to improved air quality and environmental conditions		✓
National defense		✓

fits, lower overall transportation costs are reflected directly in lower freight costs, which reduce business costs. These cost savings could be substantial for some firms, since logistics costs can account for as much as 25 to 35 percent of the sales dollar for some companies (DOT 1995, 1–8). In turn, the cost savings will be passed on to customers in the form of lower consumer prices, as long as competitive market conditions exist. When the benefits are directly embodied in the market prices, they are considered to be internalized by the consumers, and there is no reason for government involvement to account for externalities.

The externalities associated with lower transportation costs are related to the second benefit, increasing economic productivity and efficiency. Consequently, external benefits from the first item are indicated under the second item. These benefits have important implications at the national and local levels. Increased productivity allows companies to expand production, raise wages, and create more jobs. These effects may be concentrated more in regions of the country that are home to intermodal facilities. Whereas benefits accrue to anyone with access to the intermodal freight system, proximity to these facilities may give some businesses an advantage over others, thus creating more jobs causing higher wages to be paid in that region than would be the case if the facility were located elsewhere.

Moreover, the operation of the facility itself creates jobs for those living within the labor market serving that facility. One cannot consider benefits to the national economy without considering the importance of access to the transportation system to specific regional economies. The national economy comprises regional economies that have different growth processes and characteristics. Therefore, the effects of intermodal freight activity and facilities on these regions will vary accordingly.

The ability of intermodal activities to generate higher returns is another example of an internal benefit that may be confused with an external benefit. Higher returns are incorporated in the price of the assets through the net discounted value of the physical facility. Therefore, market-oriented activities take these benefits into account through the setting of prices and the response to prices in economic transactions that involve these assets. However, the presence of an intermodal facility may benefit those who do not directly or even indirectly compensate the facility owners for providing this advantage. Even if land prices reflect the advantage of an intermodal facility, the facility owner is not compensated

for this external benefit unless the facility owner owns the land or has a way of collecting taxes from the use of the land.

Intermodal activities can reduce congestion and decrease the burden on overstressed infrastructure by spreading freight shipments across several modes. As documented by Morlok et al. (1996), intermodal rail-truck transport may reduce the air and noise pollution caused by trucks and bring about more efficient energy use (p. 9). The first two externalities are nonmarket benefits, since they are not captured in the price of the transportation service. Intermodal systems may also benefit users of other transportation modes. For instance, by moving cargo from trucks to rail, congestion on highways is reduced, which increases the value highway users place on highway transportation services and reduces the cost to taxpayers and others by reducing the need to build additional highway capacity.

Government could go a long way in reducing pollution and congestion caused by highway use by pricing highways properly. For instance, trucks do not pay the full cost of using highways. Because roads are underpriced, truck shipments are also underpriced, and there is an incentive to ship by truck rather than alternatives, such as rail. Furthermore, neither passenger vehicles nor trucks pay congestion costs. The price of using a highway system is the same regardless of the marginal effect of adding another vehicle to the highway system. If congestion pricing were pursued, the need to build additional highways would be reduced. Nonetheless, use of the most efficient combination of transportation modes is expected to reduce energy consumption and pollution (Morlok et al. 1996).

Other Externalities and Market Failures

Another possible market failure is the existence of imperfect capital markets that distort the market rate of return. Regulated capital markets may limit the risk that lending agencies can make. This restriction may limit the payoff period in which returns exceed costs and thus causes underestimation of the profitability of the project. The absence of complete insurance markets may also inefficiently restrict the amount of risk that financial markets may take. Market interest rates may be above optimal social discount rates, particularly for long-term loans.

Second, market profitability takes into account only the net benefits of the marginal consumer. However, consumers (except for the marginal one) who actually consume the product are willing to pay more for the product than the market price. Consequently, the value they place on their consumption is higher than the market price. The difference between their willingness to pay and the market price is called consumer surplus. Governments, through their taxing authority, can extract part of this surplus to help finance the construction of the facility.

Third, the project may result in income redistribution, which increases the social welfare of the community. Whereas some argue that income distribution can be changed more directly through the tax/transfer structure, political, economic, and social constraints on this more direct method may make it easier to pursue redistribution objectives through project selection. For example, it is simple to bring about income redistribution by locating a project in a poor or high-unemployment region instead of a wealthy, low-unemployment area, so long as local residents are employed by the project.

Government Subsidies and Taxes

For all these reasons, government intervention may be warranted, depending on the relative magnitude of these characteristics. Government would intervene in basically two ways: subsidize the facilities according to the level of positive externalities it generates, or tax the facility to recover the costs of the facility on the surrounding economy. In theory, it is conceivable that the levels of subsidies and taxes could be determined so that the facility is fully compensated for the value placed on its positive externalities and that taxes or penalties totally offset the costs of emitting pollution or other negative externalities, or the fact that the prices are not true market prices. However, in practice, this would be very difficult, since the calculation of externalities and of the tax and subsidy instruments to offset them is imprecise. The more these subsidies and taxes are out of line, the more inefficient the allocation of resources.

Disentangling Externalities

When considering externalities, it is important to separate the externalities accruing from existing transportation modes from those attribut-

able directly to intermodal freight activities. For instance, highways support transportation services apart from intermodal possibilities. Some estimates suggest that highways have externalities that result in higher rates of return than are generated by private capital (Nadiri and Mamuneas 1996). Yet, when considering the external benefits of intermodal freight facilities, the benefits generated by the existing highway system should not be considered. Only the benefits resulting from additional highway use (or less highway use) as a direct result of intermodal freight activities can be considered.

FREIGHT FACILITIES AS AN ECONOMIC DEVELOPMENT TOOL

The material in this section is borrowed heavily from Bartik (1990).

Economic development efforts, either through subsidizing private businesses or investing in public services such as infrastructure projects, can be justified on the grounds of market failure of the regional economy. For instance, regional economic development policies will encourage the expansion of benefits that private markets fail to recognize adequately. What differentiates these externalities from the ones in the previous section is that intermodal freight facilities are not the only project that could address these regional market failures. Many other projects, including improvements in education and training as well as simply subsidization of private business investments, may produce similar results. These policies are efficient if the value of these nonmarket benefits exceeds program costs. However, the justification of government intervention for this reason hinges on the magnitude of these benefits. Unfortunately, the level of sophistication in data collection and in evaluation of the costs and benefits of projects, particularly with respect to externalities, is not sufficient to obtain precise answers. The first step, then, is to understand the forms that nonmarket benefits may take.

To continue the hypothetical cases used to illustrate the three types of market failure, consider the proposal by a consortium of governments within a metropolitan area to build an intermodal facility integrating air, rail, and truck shipments. The facility is located next to an industrial park. The governments argue that the intermodal facility would be a catalyst for a sluggish local economy and position the area for an

expected increase in air freight. They expect that businesses who use or expect to use air freight will locate in the area, particularly in the industrial park, providing jobs for the local unemployed and increasing the critical mass of businesses, which will benefit all businesses in the area. To finance this facility, they provide a tax abatement, which is financed out of the general fund. *In this case, the local government proposes to build an intermodal facility as an economic development initiative to address the market failure problems of unemployment and enhance the region's agglomeration economies, which in turn reduces the cost of doing business for many businesses in the area.*

This case has to do with government intervention, in the form of an infrastructure project, to correct perceived market failures of high unemployment and economic activity below a critical mass. The facility generates benefits beyond the customers who directly use the facility, but the benefits are not necessarily related to transportation services. Rather, the facility is used as one of many possible government interventions to spur local economic development.

Why should government intervene, particularly in the form of subsidies to attract businesses, when businesses are apt to locate and expand anyway? There are several types of broad market failures that could be addressed by government intervention.

First, unemployment may result from market failure if individuals without jobs are willing to work at prevailing wages for jobs they are qualified to fill. Government intervention is justified if the investment or subsidies cost less than the value of the employment benefits. Similar arguments can be made for underemployment of local workers, in which workers in some industries seek jobs in other industries that pay more and for which they are qualified. Shifting a regional economy toward high-wage industries provides nonmarket benefits that are a possible goal of regional economic development.

Second, publicly provided services, such as a government-sponsored intermodal freight facility, benefit businesses and residents. A perfectly efficient state and local tax system would set the taxes paid by a business or household equal to the marginal cost of providing that public service. In this form, the tax would be equivalent to a user charge. The distinction between a government-sponsored investment and a government-subsidized investment, as discussed in the preceding section, is somewhat vague. The first starts as a government project with specific external ben-

efits to the community that justify its investment. The public-good nature of the project leads to questions concerning the efficient financing of the project, with perhaps some combination of user charges and a general tax instrument. The possibility of user charges brings up the notion of marginal cost pricing, which will be touched on in a later section. The second is a private venture; the issue is whether externalities are sufficient to justify government intervention. The project may be viewed first as generating private benefits sufficiently internalized by private agents that market prices can be used to finance the venture, along with whatever subsidies are offered.

The net fiscal benefit of infrastructure investments depends on the particular circumstances of the regional economy. For instance, if a region is growing quickly and bottlenecks occur in the current transportation system, additional investment designed to alleviate the bottlenecks would benefit the region. On the other hand, if a regional economy is declining because of a loss in comparative advantage, intermodal freight facilities with innovative systems may benefit the region by offering lower-cost transportation, which in turn may lower costs of doing business in that region and attract businesses. However, if transportation systems are underused because of the lack of economic activity in the area, subsidies to businesses or other economic development efforts may be more effective.

Third, cost savings can accrue to businesses when economic activity in a region reaches a critical level. Economists refer to this benefit as agglomeration economies. By creating or enhancing a transportation node, intermodal freight operations may attract businesses within similar industries, using similar suppliers, drawing from common labor pools, and so forth. If these benefits are realized, the justification for government intervention is that a business's location decision fails to recognize that its agglomeration economies benefit other businesses. Empirical research indicates that only cities just below the critical mass of economic activity may benefit from a program that encourages economic expansion [a literature review is given by Eberts and McMillen (forthcoming)].

Other market failures addressed by economic development initiatives include the underinvestment in education and training and the underdevelopment of research and innovations. They will not be elaborated on here, since it is not likely that intermodal freight investment

will have much of an effect on these areas. However, whether they have an effect that warrants government intervention, as in the previous cases, is an empirical matter.

As in the first case, it is conceivable that government subsidies and taxes can be levied such that all the external benefits and costs are fully compensated. If this were to happen, the freight facility would be analogous to a private entity with no externalities. Consequently, the facility would have no external effect on the rest of the local economy, because all of the benefits and costs have been extracted through the tax and subsidy system.

DETERMINING GOVERNMENT INVOLVEMENT

The possibility that an intermodal facility could yield external benefits and costs is a convenient justification for government intervention. However, in many cases it is not defensible from a benefit-cost perspective because of the lack of reliable information about whether the facility actually generates externalities and the magnitudes of these effects, particularly the type of information that would be useful in comparing the various benefits. The lack of precise estimates of the magnitudes of internal versus external effects makes it difficult to determine whether intermodal freight activity should be left exclusively to the private sector or government should become involved. Simply because intermodal freight activities generate externalities that appear to be reasonable does not warrant government involvement. A determination should be based on the magnitude of the externalities relative to internal benefits and to public goals with regard to the reduction of pollution and congestion or economic development.

The inability to measure externalities has been and continues to be a major problem in using benefit-cost analysis for public investment decisions. A United Nations' handbook on the methodology and practice of national benefit-cost analysis for industrial project preparation and evaluation plainly states that "it appears to be practically impossible to quantify many externalities." The authors conclude, "At our present state of knowledge it appears to be impossible to prove decisively that one project is inferior to another in terms of its contribution to indirect benefits." In the context of determining the appropriate involvement of government in intermodal freight projects, this conclu-

sion would be paraphrased to state that it is impossible to determine decisively the appropriate involvement of government on the basis of the extent of externalities. Nevertheless, the United Nations guidelines do not advocate ignoring what cannot be precisely measured: "We cannot emphasize too strongly that this is not a good reason for ignoring externality" (United Nations 1972, 66–67).

In the absence of precise estimates of externalities, rules of thumb have been adopted. For instance, the federal grants for Interstate highways have matching ratios of 90 percent federal and 10 percent state. If this ratio reflected external benefits accruing to highway users who live outside the state, we would expect 90 percent of the benefits to flow outside the state. Readily available statistics show that this ratio may overstate the extent of benefits from highways flowing outside the state. The U.S. Department of Transportation estimates that only 30 percent of a state's Interstate highway traffic is out of state. On the other hand, freight-related shipments within state, based on vehicle registrations, are somewhat closer to the state-federal funding ratios but still fall short. For instance, the average percentage of vehicle miles of for-hire trucks traveled outside the state of registration averages around 50 percent. The range varies depending on the size of the state: 17 percent for California and 77 percent for Rhode Island. However, the ratio based on the weight of shipments is further from the funding ratio. For example, 25 percent of the goods (by weight) originating in Michigan are shipped to destinations outside of Michigan (Bureau of Transportation Statistics and Bureau of the Census 1996). Yet when value of shipments is used, the percentage of goods originating in Michigan shipped out of the state is closer to 50.

If we assume that states are responsible for road construction, as they traditionally have been, an efficient funding formula for federal assistance would be based on the percentage of highway use by those outside the state. As illustrated by these four measures, it is difficult to decide on the appropriate measure, even when we have reasonable estimates from which to choose.

How should one proceed when such information is not available?⁴ The first step would be to list the range of benefits that are likely to flow

⁴ A lengthy document could be written on the possible sources of information about transportation use that may be helpful in estimating the extent of externalities. However, this is beyond the scope of this paper and would miss the point that, whereas some estimates are available, the current state of knowledge can offer only inferior proxies of externalities.

from intermodal freight facilities. This would be tantamount to checking the various boxes in Table 1 and adding up the number of checks. It is reasonable to assume that the wider the range of benefits, the greater the overall magnitude of externalities.

Another step in this process would be to consider components of the intermodal freight facility that traditionally are built and operated by the private and government sectors. In this regard, it is convenient to think of intermodal freight systems as comprising three components: the terminal, terminal access, and communication among modes. The terminal typically includes the warehousing and loading facilities. The warehouse could be a covered area or simply an open yard for storage of goods awaiting shipment. The loading facilities include the mechanical devices for transferring cargo as well as the road and rail lines within the terminal compound. Terminal access includes the roads, highways, and tracks linking the terminal facility to the national highway and rail systems. Information concerning destinations, departure and arrival times, liability, customs, and billings must also move efficiently between terminals and shippers to ensure a seamless movement of goods.

As indicated in Table 2, these three components can be easily classified as performed by either the private or the public sector. The terminal facility proper is typically a private venture, particularly for truck-rail facilities (DOT 1995, 1–19). Therefore, there may be little justification for government to become heavily involved in this aspect of the activity. On the other hand, terminal access may be considered an area where government has been traditionally involved, particularly with respect to highway and water access. With highways, for example, state and local governments have primary responsibility for highway construction in financial partnership with the federal government. Furthermore, as mentioned previously, if the federal-state funding ratio is

TABLE 2 Typical Public-Private Responsibility for Intermodal Freight Activities

	PRIVATE	PUBLIC
Terminal	✓	
Terminal Access		✓
Communication Across Modes	✓	✓

any guide, highways are perceived to have extensive externalities, although research cannot justify the existing funding ratio as based solely on the level of externalities. Thus, access to existing transportation modes, as a component of the intermodal activity, could be assigned to government entities. Finally, communication and coordination may be considered within the realm of both private and public entities, and the choice may depend on each entity's relative capacities to contribute to this component of the activity. Additional criteria with regard to which level of government should become involved, if government involvement is indeed justified, are included in the next section.

COMPETITION AMONG GOVERNMENTS

We have made the argument that government has a role in intermodal freight systems if nonmarket benefits or other market failures are large enough that the benefits to society are greater than the cost of the government intervention. The next question is whether the pursuit of investment in intermodal transportation by individual state and local governments acting independently to foster economic development in their regions is efficient. It has been argued that competition among local governments leads to an overinvestment in various infrastructure facilities and excessive and needless subsidies to business, which in turn takes resources away from important public services and increases tax rates.⁵

One concern with regional competition for intermodal freight facilities is inefficiencies associated with building too many large facilities, such as seaports, which have extensive economies of scale. If two cities along the same seacoast decided that each needed a port with intermodal facilities to enhance local economic development, problems may arise from a less-than-optimal volume of activities for both ports. As mentioned earlier, some intermodal freight facilities may be char-

⁵ Two of the more vocal proponents of this view are Arthur Rolnick and Melvin Burstein of the Federal Reserve Bank of Minneapolis. Their views, and the views of others on both sides of the argument, are found in a special issue of the *The Region*, entitled *The Economic War Among the States*, published by the Federal Reserve Bank of Minneapolis in June 1996. The issue contains papers and proceedings of a conference on the topic sponsored in part by the bank and Minnesota Public Radio.

acterized as natural monopolies, in which average costs decline throughout the range of operations. However, if two facilities within close proximity share the volume, the average cost will increase for both facilities, and the efficiency of the entire freight system that is linked to these ports will be reduced. Moreover, if these ports find themselves running a deficit, government may be called on to subsidize the facility to a much larger extent than would be necessary if only one port were in operation. On the other hand, if substantial bottlenecks exist because the existing port is operating far beyond capacity, a second port may be necessary. Yet the question remains as to whether the existing port should expand and capitalize on additional economies of scale or another port should be established.

Proponents of development incentives argue that they “create a business-friendly, entrepreneurial climate; promote local job opportunities and worker training; enhance private sector productivity and competitiveness. Opponents charge that these giveaways divert government money from supporting traditional public goods like education, frequently cost far more than any realized benefits, misallocate resources and make everyone worse off” (Farrell 1996). Proponents also argue that states, by pursuing their own self-interest, are laboratories for innovative programs; opponents counter that states are impediments to economic union.

CRITERIA FOR EFFICIENT LOCAL ECONOMIC DEVELOPMENT INITIATIVES

There are several criteria to determine whether such incentives are detrimental to national efficiency and thus national growth. The criteria are adapted from Bartik (1994). The first is that as long as the benefits exceed the costs of government intervention, local competition may not produce undesirable effects and will enhance national efficiency.

Second, economic development incentives that enhance business productivity will enhance the national economy. Reallocating resources to their most productive use is the hallmark of freely functioning private markets. The same can be said of government intervention, under special circumstances. If government intervention reallocates resources toward more productive uses, national economic efficiency is improved.

The benefits are particularly promising when government intervention takes place in poor areas with high unemployment.

Third, subsidies would be considered unproductive if discretionary subsidies provided to selected firms would not have any permanent effect on the local economy if they leave the area. It is clear under this definition that subsidizing the building of an intermodal freight system would be productive, since benefits of infrastructure improvements and more efficient transport systems would remain even if the firm that initiated the project left the area. A problem would arise only if the facility was abandoned before generating benefits sufficient to justify its subsidy.

Arguing that investment in freight systems by state and local governments raises national efficiency is easy in theory, but it is not easy to meet the conditions necessary for this to happen. For instance, we have assumed that state and local governments provide subsidies that do not exceed the net external benefits of the project. However, if the subsidies are greater, competition could be detrimental to the national economy. Furthermore, if state and local governments are inclined to offer subsidies that exceed the net external benefits, there would be a tendency to overinvest in these facilities.

Two aspects of state and local government financial decision making may lead to the provision of subsidies that are too generous. First, the political horizon of elected officials is short relative to the life of an intermodal freight terminal and its ancillary infrastructure. Governors and local officials are apt to negotiate subsidies that provide a large share of the subsidies after the current term of office is over. Second, there are typically few fiscal constraints on the amount of subsidies that may be offered. Tax abatement, in particular, is not included on the expenditure side of the government's budget, and consequently there is little fiscal constraint on these decisions.

Several proposals have been offered to address the issue of competition among state and local governments (Farrell 1996):

1. Disclose incentive offers made during the bidding process, including disclosure by company.
2. Initiate a multistate compact that would share information, create an analysis model, identify "best" and "worst" practices, and note legal risks and costs.

3. Encourage legislators to adopt uniform standards and accountability measures.

4. Develop standards for awarding incentives that derive from best practices. State and local governments should include in these standards an assessment of the quality of jobs and their availability to local populations. These standards would include performance and enforcement mechanisms.

5. Establish a multiorganization task force to promulgate uniform reporting standards that would measure and evaluate the costs and benefits of incentives.

The network nature of transportation facilities raises another issue related to government involvement. The value of transportation facilities is related to their ability to link locations. For networks to work efficiently, access standards (e.g., lane widths, bridge widths and clearances, tunnel heights, load capacities, etc.) must be maintained. Because transportation systems are costly and consume valuable land rights-of-way, they should be built with minimal redundancy except for what is needed to ensure that access is maintained when branches of the network are closed down or traffic flow is slowed. If governments are involved in building and maintaining freight transport facilities, the question arises as to whether centralized decision making is necessary to ensure efficient networks or decentralized decision making by state and local governments will suffice.

There are two ways to view the network dimension to the question of government intervention in freight transportation systems. The first view is that accessing transportation networks is an economic benefit to local areas. Therefore, economic development initiatives that provide new access or improve access to a transportation network are likely to offer benefits to a local economy (with the usual conditions mentioned earlier). In addition, increased traffic flow may create the demand for more direct routes to destinations. If these routes are constructed, the system is enhanced. Vickrey (1972) suggests that there are significant economies of scale when traffic demand creates more direct routes within the network. This benefit is akin to the expansion of networks within the Internet system. However, unlike the Internet, surface transportation imposes significant costs when additional links are constructed within the network. Therefore, the second view is that access to net-

works imposes costs. Additional access and additional traffic may introduce costs in the form of congestion, impeding the flow of all participants in the system (until perhaps additional links are established), which may not be accounted for in the usual benefit-cost calculations. Of course, building capacity to transportation systems in the form of additional routes and additional lanes on existing corridors results in land right-of-way costs and construction costs, which must be balanced against the benefits mentioned earlier.

ROLE OF VARIOUS LEVELS OF GOVERNMENT

If the criteria given in the preceding section are followed, the choice of the appropriate level of government would not be affected by the concern that investment by local governments in intermodal freight activities is necessarily inefficient. A basic tenet in economics is that the government jurisdiction should encompass the region on which the benefits or costs of a particular activity fall. Examples are water districts, air quality districts, and port authorities. Traditional government jurisdictions such as cities, counties, or states rarely match the extent to which externalities are contained within their jurisdictions. Therefore, various responsibilities are more appropriately assumed by different levels of government according to the extent of the externalities.⁶ For example, federal involvement in financing the Interstate highway system is justified on the grounds that the benefits of the system extend beyond local and state boundaries. Port authorities, transcending city and county boundaries, include areas that are perceived to receive benefits from the operations and that contain the various components of the transportation system under the responsibility of the port authority. Federal involvement is also justified on the grounds that the construction and operation of an efficient highway network requires coordination throughout the system.

⁶ Another consideration is the mobility of the businesses and households within the jurisdiction and how sensitive they might be to changes in taxes or the level of services. The more mobile the population, the larger the area of the jurisdiction. It is this principle, along with the first, that supports the federal government's responsibility for income redistribution.

Therefore, the level of government that should intervene depends on the characteristics of the intermodal freight facility. If the facility generates externalities that extend beyond its direct customers, there is reason for government intervention. If the externalities extend beyond the boundaries of the local jurisdictions, there is reason for higher levels of government (e.g., special districts, counties, states, or the federal government) to take responsibility. As shown in Figure 1, the intermodal freight terminal can be considered as the core of several concentric circles. The innermost circle represents the benefits that are internal to the operation of the facility and that will be reflected in market prices. Included in this circle are the characteristics of the terminal, such as economies of scale and access to transportation systems. The next outer circle encompasses benefits that accrue to the local economy that are not reflected in market prices. The outermost circle captures the external

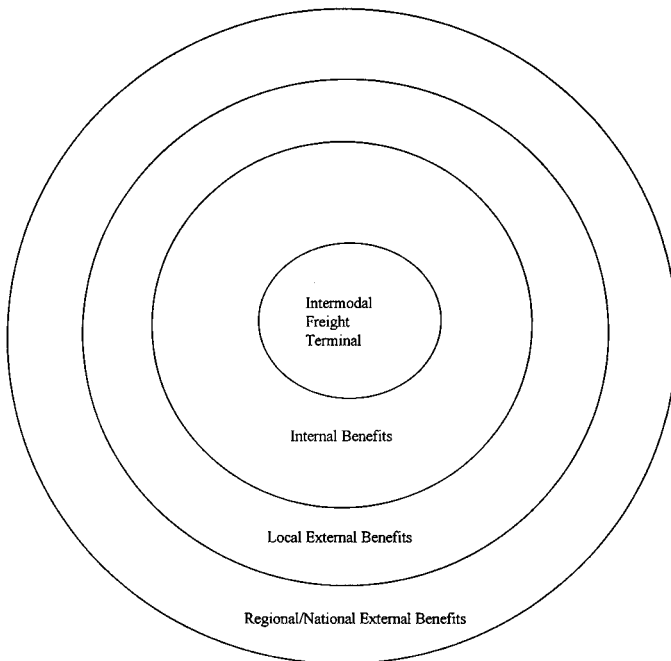


FIGURE 1 External benefits from intermodal freight activities.

benefits that go beyond the local area. If an attempt were made to draw these circles to scale to reflect the relative amount of benefits, the incremental radius of each circle could be drawn accordingly. The role of government then depends on the relative distances between the first and second circle (local government involvement) and the second and third circles (state and federal involvement).

FINANCING ARRANGEMENTS

Once the combination of private-public involvement in intermodal freight activity is determined by the criteria given in the paper, financing instruments and arrangements can be determined. Whereas it is not the purpose of this paper to offer suggestions for specific types of financing, the options that appeared in the final report of the National Commission on Public Works Improvement (Revis and Tarnoff 1987, 113) are set forth:

1. Leasing facilities,
2. Franchises,
3. Contracting for services,
4. Direct public and private bargaining over infrastructure finance (particularly where developmental projects are involved),
5. Transfer of development rights,
6. Assessment districts,
7. Local growth-management programs (as in California),
8. 100 percent vendor ownership,
9. Limited partnerships,
10. Leveraged leases for privatizing financing,
11. Tax breaks, and
12. Low risks (with guaranteed cash flows through service contracts).

Whereas the list appears extensive, obviously not all options can be pursued. One of the problems that prompted the formation of this commission is the increased competition for public funds to finance transportation infrastructure. State governments provide slightly more than 50 percent of total highway funds, with about 22 percent coming

from the federal government and the remainder from local government. All levels of government are pressed for funds to maintain and upgrade the highway system, not to mention the current issues with rail and water ports. By making freight transportation more efficient through more efficient use of existing facilities and more efficient pricing, intermodal freight activities could reduce the funding burden.

Recognizing that the current state of knowledge about the costs and benefits of transportation infrastructure and the effects of economic development incentives in general is insufficient to yield an optimal solution through such methodologies as benefit-cost analysis, it follows that the financing question should be approached from a pragmatic perspective. Financial ventures, such as intermodal freight facilities with their ancillary components, are from the beginning a partnership between the private and public sectors. This partnership would exist even if the private sector funded the entire project, simply because of all the regulations at all levels of government that must be addressed. Also, extensive coordination is required for the intermodal facility to access the highway, rail, and water systems, and this entails working with many different government agencies. Conversely, the partnership would involve the private sector even if a government entity decided to fund the entire project, since private transportation carriers will ultimately use the facility.

The pragmatic view, then, is to consider the available resources of all parties and the extent to which the stakes of the various partners in the venture can be justified. The financial commitments of the stakeholders rest in part on asking the appropriate questions about the distribution of benefits across all parties and assembling reliable and convincing evidence of this distribution.

PROCEDURAL STEPS

Given the multitude of factors that should be considered in determining government involvement in intermodal freight activity, several steps to follow in organizing and assessing the relevant information are given. The first two steps assess the economics of the terminal facility and the conditions of the linkages to the transportation networks and determine what, if any, government subsidy may be required to support operations.

Step 1: Ask questions about the intermodal freight terminal.

- What are the internal benefits of expanding the facility?
- Is the facility operating beyond capacity and creating bottlenecks?
- Would expansion of the existing terminal alleviate bottlenecks?
- Would expansion reduce the average cost of operations and thus provide transportation services at a lower price?
- Would construction of a new terminal alleviate bottlenecks and enhance intermodal freight activities?

If the answer to one or more of these questions is yes, calculate the expected revenue and costs of the operation and the projected deficit (if any) in terms of net present value.

Step 2: Ask questions about access to the intermodal freight facility.

- Do bottlenecks that impede efficient access from the transportation systems (e.g., highways, rail, waterborne shipments) to the intermodal facility exist?
- Could additional modes be connected to the intermodal facility so that it would further enhance the transportation network?

If the answer to one or both of these questions is yes, calculate the cost of making these improvements. The next step is to sum the costs in Steps 1 and 2 and compare them with the revenues generated by the intermodal freight facility. If the ratio of costs to revenues is greater than 1, the facility within its present volume and pricing scheme cannot cover costs. For instance, if the ratio is 1.2, then 20 percent of the costs are not covered by revenue from the private sector.

Justification for government subsidies to help finance the deficit depends on sufficient levels of external benefits. Since precise estimates of externalities are very difficult if not impossible to obtain, Step 3 provides a method of calculating a rough estimate of external benefits. It should be kept in mind that tax financing may entail an additional cost, as described in the section on inefficient government financing.

Step 3: Determine the existence of external benefits generated by the intermodal freight facility.

- Use the checklist provided in Table 1 to determine what external benefits may be generated by the facility.

- With respect to economic development goals, determine the number of additional jobs and the amount of income that might be generated by the expanded facility, or the number of jobs that would be lost if the facility closed.

We can begin to add up the value of the externalities by estimating some of the more readily quantifiable items. For example, it is fairly straightforward to estimate the value to the local community of the additional jobs created by expanding the facility or building a new one. It is important to ensure that these are additional jobs, however. Once these items are estimated, how close does the result come to meeting the projected deficit? If more externalities whose values can be easily estimated are needed to match the deficit, they can be considered, and estimates of these externalities can be added to the list. The list of acceptable estimates may fall short of the value needed to match the projected deficit. In this case, which is highly likely, other rules of thumb may be needed, including prioritizing through the political process what is important to the community.

Step 4: Determine which level of government is most appropriate for considering the subsidy.

- For each externality listed in Step 3, ask which level of government most encompasses the benefits. Use the concentric circle diagram in Figure 1 to give a rough approximation of the spatial boundaries of these benefits.
- Assign priorities to these externalities on the basis of traditional roles of government, such as national defense to the federal government and job creation to the local government.

For the involvement of local governments to be efficient, the criteria for efficient government provision addressed in a previous section should be considered.

CONCLUSION

The U.S. freight transportation system has had a long history of single-mode use. Intermodal freight activity provides an opportunity to use the single modes more efficiently, reducing transportation costs,

increasing productivity, and generating external nonmarket benefits. The purpose of this paper is to lay out principles that could guide the committee in providing recommendations for government involvement in the construction and operation of intermodal freight facilities. The conceptual framework is based on the principle that freight activities are best performed by the private sector. However, it is recognized that the private sector may not provide freight transportation services efficiently because of market failures. Furthermore, it is acknowledged that the government has taken a major role in the construction of the transportation system, particularly highways, rail, and navigable waters. Therefore, the partnership between the private and public sectors in providing freight service has been long established.

Whereas the principles of government involvement are simple and clear in theory, they are difficult to implement because of the inability to generate precise estimates of the value of many external benefits. Moreover, it is difficult to determine the spatial boundaries of these externalities and thus assign responsibility to various levels of government. There is insufficient knowledge of the cost structure of intermodal freight facilities to determine whether their marginal cost curves are below their average cost curves over the feasible range of operations characteristic of natural monopolies. The difficulties are exacerbated by inefficiencies inherent in the local government sponsorship of some projects that may lead to an inefficient allocation of resources at the broader regional or national levels.

Using a simple cost-benefit methodology and rules of thumb for determining externalities, a framework is presented in this paper on how to account for these factors. These principles should be helpful in organizing important factors into cost and benefit categories to aid in the decision process. They can be of further use when the various stakeholders from the private and public sectors come together to collaborate to various degrees on expanding and improving the nation's intermodal freight facilities.

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Federal Surface Transportation Legislation and Freight

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The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) was passed by Congress on December 18, 1991. In this paper, the provisions and congressional intent of ISTEA related to intermodal freight transportation are described. The implementation of ISTEA is discussed, and outcomes are compared with expectations. Finally, changes and additions to future federal surface transportation legislation and program implementation that affect intermodal freight transportation are suggested.

LEGISLATIVE BACKGROUND

Origin and Intent of Intermodal Provisions in ISTEA

A chairman of the Appropriations Committee is said to have told his members, "We are out of money; we must think." The dilemma Congress faced in ISTEA was that transportation demands far exceeded the \$20+ billion annually available for the program. The challenge was how to do more transportation with less money. The answer was, at least in part, to manage the transportation system more efficiently. The

necessity of addressing this financial dilemma was a significant factor in leading Congress to what has become known as intermodalism in ISTEA. Viewing the transportation system as an intermodal, or multimodal, system focused Congress's attention to nonhighway modes of transportation, including freight rail transportation.

The credit for coining the term "intermodalism" and including "intermodal" in ISTEA goes to Congressman Bob Roe, Chairman of the House Transportation and Public Works Committee during ISTEA. Chairman Roe's interest in intermodalism came from his experience in New Jersey and his state's transportation needs. Transit was important, waterways and ports were key economic resources, and several large projects in the state included components of several modes. The New Jersey Department of Transportation and Chairman Roe were looking for a flexible program structure and funding source that would fit these multimodal projects.

Whereas the transportation jurisdiction was fairly consolidated in the House Transportation and Public Works Committee during the time of ISTEA, one element—freight rail—was under the jurisdiction of the powerful Energy and Commerce Committee. Under the leadership of Chairman John Dingell, the Energy and Commerce Committee had the reputation of looking for ways to extend its jurisdiction. Chairman Roe of the Transportation and Public Works Committee was interested in expanding the kinds of projects that could use Highway Trust Fund money. Members of Chairman Roe's committee were concerned, however, that if freight rail projects were eligible for Highway Trust Fund money, Chairman Dingell would see this as an opportunity to extend the jurisdiction of the Energy and Commerce Committee to the Highway Trust Fund. An additional concern of Transportation and Public Works Committee members was that, if Chairman Dingell were successful in claiming some jurisdiction over revenues in the Highway Trust Fund, he might expand eligibility even further and use Highway Trust Fund money for other purposes under the jurisdiction of the Energy and Commerce Committee. As a result of these concerns, the House bill contained a significant number of references to the importance of intermodalism, including freight rail, but very little access to Highway Trust Fund money for intermodal freight rail projects.

The Senate ISTEA bill did not use the word intermodalism. However, the concept of intermodalism was part of the vision of the Senate bill. The senators were thinking in inclusive, multimodal terms. Sena-

tors Daniel Patrick Moynihan, Chairman of the Subcommittee on Water Resources, Transportation, and Infrastructure, and John Chafee, Ranking Member of the Senate Environment and Public Works Committee, wanted a transportation bill, not a highway bill. This was notable considering they were on the committee with jurisdiction over the highway program. It was also a challenge because four committees in the Senate have some jurisdiction over transportation legislation. The Senate Environment and Public Works Committee has jurisdiction over the highway program, some aspects of trucks, and portions of highway safety. The Commerce, Science, and Transportation Committee has freight rail, aviation, the regulatory aspects of trucks, and portions of highway safety. The Banking, Housing, and Urban Affairs Committee has transit, and the Finance Committee has jurisdiction over the Highway Trust Fund.

The Senate bill included several factors that helped make intermodalism possible. First, it contained unprecedented flexibility. Money that previously could be used almost exclusively for highway purposes could be used for a variety of transportation purposes. The Senate bill included intercity passenger rail as one of these purposes. Freight rail eligibility was also discussed, but both intercity and freight rail ultimately were excluded for jurisdictional reasons. In addition, there was apprehension about including them because of fear of opposition. The senators questioned how far an idea considered radical could be pushed and how much acceptance could be gained.

Second, the Senate bill included multimodal planning requirements for states and metropolitan planning organizations (MPOs).

Third, the bill established the Bureau of Transportation Statistics and charged it with collecting data for all modes of transportation.

Finally, the Senate bill was presented as a transportation bill and not a highway bill—a different way of thinking about transportation. The leadership of the Senate committee represented states with very different transportation needs—North Dakota, Rhode Island, New York, and Idaho. This was a guiding force in the resulting flexible, intermodal approach in the Senate bill. The Senate report says the following in the introductory statement (U.S. Senate 1991): “The moment calls for flexibility. No one state or city is exactly like another. Our job must be to facilitate and reward the best mix of transportation modes suited to specific jurisdictions.”

It is often said that intermodalism was not defined in ISTEA, and that is true. Intermodal projects and their eligibility were purposely not defined for several reasons: (*a*) jurisdictional issues, (*b*) concern about opposition from interest groups to sharing Highway Trust Fund resources, (*c*) a desire to allow creativity and innovation, and (*d*) lack of knowledge of how states and localities would use intermodalism because it was a new approach.

ISTEA does, however, discuss and describe an intermodal transportation system. Section 2 of ISTEA, the Declaration of Policy, provides a lengthy description of a National Intermodal Transportation System. It begins:

It is the policy of the United States to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy, and will move people and goods in an energy efficient manner. . . . The National Intermodal Transportation System shall consist of all forms of transportation in a unified, interconnected manner. . . . (Public Law 102-240)

Title V says:

It is the policy of the United States Government to encourage and promote development of a national intermodal transportation system in the United States to move people and goods in an energy-efficient manner, provide the foundation for improved productivity growth, strengthen the Nation's ability to compete in the global economy, and obtain the optimum yield from the Nation's transportation resources.

The conference report further indicates the intent of Congress: "Audacious and bold new approaches are needed if the nation is to transform the existing separate, balkanized transportation systems into a single, coordinated unit that will provide the foundation for the nation to confront the realities of the 1990s and the 21st century" (U.S. House of Representatives 1991).

Finally, the intermodal title in the House-passed ISTEA bill indicated that ISTEA "establishes as a national goal the encouragement

and promotion by the Federal government of an intermodal transportation system” (U.S. House of Representatives 1991). In many instances, however, the statutory direction does not follow the strong encouragement and promotion of intermodalism in the ISTEA policy statements. ISTEA attempts to begin to provide some opportunities for states and local governments to make choices that will lead to a more integrated intermodal transportation system. It is important to recognize that ISTEA establishes and encourages intermodalism as a goal, not as a mandate.

Summary of ISTEA Provisions Affecting Freight

ISTEA is the first federal surface transportation legislation to recognize intermodal freight transportation. Although it does not earmark specific funds for freight projects, it provides ways for intermodal freight projects or elements of these projects to be funded out of Highway Trust Fund money. The Federal Highway Administration (FHWA) published a report in 1995 describing the ISTEA provisions affecting intermodal freight transportation and the eligibility of these projects for federal-aid transportation funds (FHWA 1995).

The ISTEA Declaration of Policy recognizes the importance of intermodal freight transportation. National Highway System (NHS) funds and Surface Transportation Program (STP) funds may be used for improvements to accommodate other modes, including rail.

The Congestion Mitigation and Air Quality (CMAQ) program has been the most flexible ISTEA category and the one most easily accessed by freight rail projects. Generally, projects that have air quality benefits are eligible for these funds. Guidance from the U.S. Department of Transportation (DOT) for CMAQ eligibility indicates that CMAQ funds can be used for a rail improvement project as long as “emission reductions can reasonably be expected” (FHWA 1995).

MPOs and states are required to carry out transportation planning. ISTEA directs states and MPOs to develop transportation plans that will result in transportation facilities that function as intermodal transportation systems. They must consider two factors directly related to intermodal freight transportation: (a) international border crossings and access to ports, airports, intermodal transportation facilities, and major freight distribution routes; and (b) methods to enhance the efficient movement of freight. In many cases, the planning provisions in

ISTEA have given freight rail transportation interests, for the first time, a seat at the table when transportation decisions are made.

For a more detailed discussion of ISTEA provisions related to intermodal freight transportation, see Appendix 1.

Summary of Role Given to MPOs and States in Planning and Project Selection

In 1962 federal legislation was passed that mandated an urban transportation planning process. Implementation of this planning process was required to receive federal highway funds in urbanized areas (areas exceeding 50,000 population). Urban mass transit planning was required in 1964. Additional federal legislation was passed in 1974 that required state and local officials to implement a joint planning process for determining how their highway and mass transit funds would be used. It was to be a continuing, comprehensive, cooperative process carried out by state and local officials. It came to be known as the 3C planning process (GAO 1992).

The planning process was carried out by the MPO. The MPO is the organizational entity legally responsible for carrying out the transportation planning process required by federal law. An MPO must be designated for each urbanized area of more than 50,000 population by agreement among the governor and units of local government representing at least 75 percent of the affected population [23 U.S.C. 134(b)].

MPOs, in cooperation with the state, develop transportation plans and programs for urbanized areas. ISTEA made several significant changes in the federal transportation planning requirements.

First, the metropolitan planning area includes the existing urbanized area and must include the area expected to be urbanized within the next 20 years. In nonattainment areas, the planning area must include the entire nonattainment area unless the MPO and the governor agree to exclude some portion.

Second, ISTEA created a new designation for metropolitan areas over 200,000—Transportation Management Areas (TMAs). TMAs must develop congestion management systems as part of the planning process. If the TMA is in nonattainment for ozone or carbon monoxide, no federal transportation funds can be used for projects that increase capacity for single-occupant vehicles unless the projects are a result of an approved congestion management system.

Third, in developing programs and plans, ISTEA requires MPOs to analyze and reflect in the planning process products a number of factors, including two specifically related to intermodal freight transportation: (a) international border crossings and access to ports, airports, intermodal transportation facilities, and major freight distribution routes; and (b) methods to enhance the efficient movement of freight. Organizations that administer or operate any mode of transportation, including intermodal freight, are to be encouraged to participate in planning. Public participation in the planning process must begin at the earliest planning stages and continue through the alternatives development process and the decision on what specific solutions will be implemented.

Fourth, the MPO, in cooperation with the state and affected transit operators, develops the transportation plan and the transportation improvement program (TIP) for the designated metropolitan area. The transportation plan has a 20-year planning horizon and includes long- and short-range strategies and actions that will lead to the development of an integrated intermodal transportation system. Under ISTEA, the TIP must contain a priority list of projects and project segments to be carried out within a 3-year period and a constrained financial plan that identifies the resources that will pay for the projects. This is a significant change from prior law, under which a laundry list of projects was compiled knowing that many would not be funded in the foreseeable future.

With a constrained TIP, fewer projects can be listed on the TIP. This raised the concern that the constrained financial plan would discourage the addition of new projects, particularly the more innovative intermodal projects encouraged by ISTEA. Because of the role transportation plays in determining air quality, Congress decided that the financially constrained TIP was important in maintaining the benefits of Clean Air Act requirements. If projects that improved air quality were included in the TIP, there had to be some enforcing mechanism ensuring that states and localities actually did those projects. At the time of ISTEA, Congress viewed the financially constrained TIP as that enforcing mechanism. In some cases, the requirement of the financially constrained TIP has resulted in the perpetuation of "old" projects. But other states and localities have used ISTEA as an opportunity to review all projects on the TIP and all potential new projects eligible under ISTEA and to revise their TIPs to reflect new priorities. Remov-

ing or postponing projects that have been on the TIP for many years may be difficult, but ISTEA gives states and localities the flexibility and the opportunity to make their own decisions.

Fifth, ISTEA requires an open planning process with opportunities for the public and interested parties to be involved. Development of the transportation plan and the TIP must be coordinated with other providers of transportation, including rail freight operators. The MPO must give citizens, affected public agencies, representatives of transportation agency employees, other affected employee representatives, private providers of transportation, and other interested parties a reasonable opportunity to comment on the proposed program. The TIP must be updated at least once every 2 years and must be approved by the MPO and the governor. Once the MPO and governor have approved the TIP, it must be incorporated in the state transportation improvement program (STIP) without modifications.

Sixth, ISTEA gave more decision-making authority for project selection to local governments. In areas less than 50,000 in population, NHS, bridge, and Interstate maintenance projects are selected by the state, in consultation with affected local officials. All other projects are selected by the state, in cooperation with affected local officials.

In urbanized areas under 200,000 population, the project selection for projects using federal funds is done by the state in cooperation with the MPO and must conform with the TIP for the area.

In urbanized areas with a population exceeding 200,000, or TMAs, projects within the TMA that use federal funds (except NHS, bridge, and Interstate maintenance projects) are selected by the MPO in consultation with the state and in conformance with the TIP. NHS, bridge, and Interstate maintenance projects within the TMA are selected by the state in cooperation with the MPO and in conformance with the TIP.

Seventh, ISTEA gave additional responsibilities to MPOs in nonattainment or maintenance areas under the Clean Air Act requirements. The MPO must coordinate the development of its transportation plan with the state implementation plan (SIP) and develop, or assist in developing, transportation control measures that improve air quality. The MPO may not approve any transportation plan or program that does not conform with the SIP. In nonattainment and maintenance areas, the TIP must be found in conformance by FHWA and

the Federal Transit Administration (FTA) before it can be included in the STIP (Public Law 102-240).

Finally, ISTEA requires states to carry out a comprehensive inter-modal statewide transportation planning process that includes a statewide transportation plan and a STIP that facilitates the efficient movement of people and goods. The statewide plan must be inter-modal and provide for connections between rail, commercial motor vehicle, waterway, and aviation facilities.

The statewide transportation planning process must be coordinated with the MPO planning process and must consider a number of factors, including the following related to intermodal freight transportation: data collection and analysis; a statewide transportation plan designed to meet the transportation needs of both passenger and freight transportation including all modes and their connections; international border crossings and access to ports, airports, intermodal transportation facilities, and major freight distribution routes; transportation system management and investment strategies designed to make the most efficient use of existing transportation facilities including all transportation modes; and long-range needs of the transportation system for the movement of persons and goods.

In addition, during the development of a plan, the state must coordinate a number of efforts, including the following related to intermodal freight transportation: consideration of intermodal facilities with land use planning; transportation planning done by the state with transportation planning done by other entities including large-scale public and private transportation providers, operators of major intermodal terminals, and multistate businesses; planning done by the state with major transportation-related actions of other agencies for economic development, operation of airports, ports, rail terminals, and other intermodal transportation facilities; and planning carried out by the state with planning to meet other federal requirements including the state rail plan.

Early and continuing public involvement is to be provided to a number of groups, including private providers of transportation and other interested parties affected by transportation plans, programs, and projects.

The state must develop a STIP for the entire state. The STIP must include projects to be carried out in each of the next 3 years, identify funding sources for each project, and include all regionally significant

transportation projects regardless of funding source. The STIP must be approved by FHWA and FTA every 2 years. Both the MPO TIP and the STIP, once approved, constitute an “agreed to” list of projects. Certain procedures must be followed to change the funding sequence of these projects or to remove or add projects to the list. Generally, all parties involved in the project selection process must agree to any changes (Public Law 102-240).

Intermodal Connectors Provision of the NHS Legislation

ISTEA declared that the construction of the Interstate highway system was complete. It recognized that there was an ongoing federal interest in a portion of the highway system that carried the majority of commercial, commuter, and tourist traffic. This “interconnected system of principal arterial routes which will serve major population centers, international border crossings, ports, airports, public transportation facilities, and other intermodal transportation facilities and other major travel destinations, meet national defense requirements; and serve interstate and interregional travel” was named the NHS (Public Law 102-240).

Congress stipulated broad categories of roads that met the criteria of an NHS such as the Interstate system, the strategic highway network important for defense access, and certain major urban and rural highways. It directed the Secretary of Transportation in consultation with state and local officials to submit a specific list of highways to be included in the NHS by December 18, 1993.

The NHS was subsequently approved by Congress and enacted into law as the National Highway System Designation Act of 1995 on November 28, 1995. Congress recognized that to carry out the stated purpose of the NHS (in particular, to serve border crossings, ports, airports, public transportation facilities, and other intermodal transportation facilities), additional connectors should be included as part of the NHS. Therefore, the NHS legislation required the Secretary of Transportation to submit to Congress a list of intermodal connectors to major ports, airports, international border crossings, public transportation and transit facilities, interstate bus terminals, and rail and other intermodal transportation facilities. The list of intermodal connectors

had to be approved by Congress. Until the list is approved, intermodal connectors that the Secretary found consistent with certain criteria are eligible for NHS funds. After congressional approval, connectors on the list are part of the NHS and are eligible for NHS funds.

On May 24, 1996, the Secretary of Transportation submitted his recommendations on NHS connections to major intermodal terminals for congressional consideration. They were developed in cooperation with state departments of transportation, MPOs, and terminal operators. The criteria for selecting intermodal connectors included primary and secondary criteria. Primary criteria were based on volume or activity levels by terminal type. Secondary criteria were based on factors that demonstrate the importance of an intermodal terminal within a specific state.

During the consideration of this provision in the NHS legislation, senators from large, sparsely populated states were concerned that smaller intermodal connectors in their states be included. Though these intermodal facilities had low volumes or activity levels by national standards, they were vitally important to the mobility of their states' residents and to the states' economic well being. Because of these concerns, the NHS bill included report language to emphasize the eligibility of such facilities. The Secretary may add intermodal connectors subsequent to congressional approval of the submitted list. When adding intermodal connectors, the Secretary is directed—in considering whether a facility is major—to recognize the significance of the intermodal terminal within a state or any plans that states, MPOs, or others have to improve access to the intermodal terminal (U.S. House of Representatives 1995).

The NHS legislation also created an innovative financing mechanism called State Infrastructure Banks (SIBs). This financing method can be used to finance projects that benefit intermodal freight transportation. A SIB has been defined as “an infrastructure investment fund established to facilitate and encourage investment in eligible transportation infrastructure projects sponsored by public and/or private entities” (*Federal Register* 1996). A SIB can be used to make loans, provide credit enhancement, serve as a capital reserve for bond or debt financing, subsidize interest rates, issue letters of credit, finance purchase and lease agreements, provide debt financing security, or provide other forms of financial assistance. The pilot program allowed 10 states to participate. Subsequently, the DOT appropriations legislation for 1997 expanded this to allow DOT to designate additional states and provided \$150 million for capitalization.

IMPLEMENTATION OF FREIGHT PROVISIONS IN ISTEA

Use of ISTEA To Support Rail Freight-Related Projects

Intermodal freight-related projects have received ISTEA funding from several sources, including program funds from the NHS program, the Surface Transportation Program and Transportation Enhancement funds, the CMAQ program, earmarked demonstration project funds, and innovative financing funds. In some cases, states and localities have put together a financing package that includes funds from two or more of these categories. Whereas direct access to ISTEA funds has been limited for freight projects, in some cases highway projects funded by ISTEA have benefited rail freight or enabled rail freight projects to proceed.

There are two other potential sources of funding for rail freight-related projects. In 1994, President Clinton issued Executive Order 12893, "Principles for Federal Infrastructure Investments." As a result of this executive order, Secretary Peña established DOT's innovative financing initiative, the Partnership for Transportation Investment. The second source is the SIB program established by the National Highway System Designation Act of 1995, as discussed in the preceding section.

Following is a list of the ISTEA categories that have funded freight-related projects with the total amount authorized for each category over ISTEA's 6-year authorization period. A project receiving funds from the particular category is also given. For a more extensive listing of projects receiving funding, see Appendix 2.

- NHS: \$21 billion over 6 years. The Philadelphia, Pennsylvania, Tioga Marine Terminal is a water/rail/highway intermodal transfer facility. Improvements to remove impediments to highway access were undertaken. NHS funds were used for signaling and turning radius improvements.

- CMAQ program: \$6 billion over 6 years. Columbia Slough Intermodal Expansion Bridge in Portland, Oregon, will provide a rail access bridge to the Port of Portland.

- STP: \$23.9 billion over 6 years. Ventura County, California, is purchasing abandoned and existing rail corridors to replace some truck

movements. STP funds of \$4.2 million and STP enhancement funds of \$3.5 million are being used to acquire the rail branches.

- STP transportation enhancements: \$2.3 billion over 6 years. The Ohio/Panhandle Rail Line in southeastern Ohio used STP enhancement funds to purchase and operate a rail freight corridor. If the rail corridor is ever abandoned, a bikeway trail must be developed in the corridor.

- Bridge program: \$16.1 billion over 6 years. Any bridge on a public road is eligible. Activities to accommodate truck or rail freight movements are eligible, including bridge clearance projects.

- Demonstration project funds: \$437 million for priority intermodal projects. The Alameda Corridor project in California will connect the Ports of Los Angeles and Long Beach to rail yards. The rail facilities will be improved and a track 32 km (20 mi) long will be grade separated.

- Planning and research funds: The Pennsylvania Department of Transportation (PennDOT) coordinated a project to remove impediments to double-stack rail operations serving the Port of Philadelphia. Funds were used for PennDOT's study of project benefits and costs.

- Mixture of ISTEA funds: Santa Teresa intermodal facility will apply advanced technology to speed truck and rail freight between New Mexico and Mexico. Demonstration project, Intelligent Transportation Systems (ITS), and STP funds have been used for initial feasibility studies, preliminary engineering, and environmental work.

- Innovative financing projects: Cincinnati Third Rail Line: Norfolk Southern provided upfront financing and the Ohio Department of Transportation provided its share through partial reimbursement over several years by advance commitment of CMAQ funds (FHWA 1995; TRB 1996).

- SIBs: The California SIB would provide a credit enhancement to Caltrans and a private consortium to support privately issued revenue bonds. The bonds will be repaid through cargo fees (DOT 1996d).

MPO Involvement in ISTEA Freight Matters

Some states and MPOs have long considered freight issues in their transportation planning efforts. ISTEA was the first federal law to require it. MPOs play a critical role in the performance of the intermodal freight transportation system. Many of the freight intermodal

terminals are in urban areas. Urbanized areas account for about 80 percent of the country's economic output (DOT 1996a).

Out of 15 factors that ISTEA directs MPOs to consider in preparing transportation plans, two relate specifically to intermodal freight: (a) "methods to enhance the efficient movement of freight" and (b) "access to ports, airports, intermodal transportation facilities, major freight distribution routes . . ." The planning regulations promulgated after ISTEA did not prescribe in detail how states and MPOs were to consider freight issues in the planning process. Therefore, MPOs and states have incorporated freight needs into transportation planning in a variety of ways. ISTEA planning requirements have resulted in public-sector officials developing intermodal planning tools. However, they cost money and take time to develop.

One mechanism MPOs have developed to consider intermodal freight issues and bring the private sector into the planning process is the freight advisory committee. Several MPOs that have established freight advisory committees, and the kinds of activities they have participated in, are as follows (DOT 1996c):

1. The Puget Sound Regional Council (Seattle-Tacoma, Washington). Originally created to help with the Metropolitan Transportation Plan, the Freight Mobility Roundtable has also helped the MPO collect freight data, put together a list of short-term improvement projects, and educate other members of the freight community about the MPO planning process. The most valuable outcome of the roundtable has been the voice the private freight sector has gained in the MPO planning process.

2. The Metropolitan Transportation Commission (San Francisco, Oakland, and San Jose, California). The Freight Advisory Council has compiled a list of short-term projects to alleviate bottlenecks, surveyed truck drivers, and helped with goods movement planning workshops.

3. The Capital District Transportation Committee (Albany-Schenectady-Troy, New York). The Goods Movement Task Force has helped identify major problems facing freight infrastructure, recommended solutions, and identified performance measures for freight planning.

4. Toledo Metropolitan Area Council of Governments (Toledo, Ohio). The Railroad Task Force has participated in long-range planning, coordinated rail corridor studies, and sponsored rail safety education programs.

5. Chicago Area Transportation Study (CATS, Chicago, Illinois). The Intermodal Advisory Task Force has helped CATS identify bottlenecks, write the intermodal element of the TIP, and complete an inventory of the region's intermodal facilities. According to private-sector participants, participation in the task force helps in the achievement of three objectives: (a) avoidance of unwise actions, such as closing an expressway terminal or facility; (b) preservation of the existing competitive balance between private companies; and (c) development of working relationships with CATS and other companies. A major challenge to the future of this partnership rests with the private-sector members. Participation by rail carriers is high, but other industry sectors have had less participation. The challenge for CATS is to show more immediate progress toward solutions to problems.

6. Northern New Jersey Transportation Planning Authority. The authority carried out an intermodal coordination study and created an advisory committee from public and private interests to assist the study team. The objectives of the study were to (a) identify the infrastructure, systems, and institutional deficiencies adversely affecting intermodal freight operations in northern New Jersey; (b) analyze and evaluate those deficiencies; and (c) prepare a program of recommended actions designed to remedy such deficiencies.

MPOs have used their freight advisory groups in many different ways, including generating lists of short-term improvements, assisting in large-scale corridor studies, working on specific projects, collecting data, and assisting in modeling efforts (DOT 1996c). The most successful efforts are results oriented and identify short-term projects to address specific problems.

The Baltimore, Maryland, MPO has targeted freight movement as a top priority. It has established the Baltimore Region Freight Movement Task Force. Its work plan includes making recommendations on intermodal management systems and freight movement strategies, collecting freight data, establishing a performance measurement system for freight movement, projecting short- and long-term freight facility needs, and formulating a regional freight movement strategy.

In response to the intermodal emphasis in ISTEA, the private sector has established the Freight Stakeholders National Network. The network is a consortium of eight national industry associations whose

goal is to promote freight mobility through “freight stakeholder coalitions” all over the country.

In some cases intermodal freight movement issues cross state boundaries, and public- and private-sector officials are forming regional groups. The Western Transportation Trade Network organized by 16 western states is identifying high-priority freight corridors and intermodal facilities in its region. The New England Transportation Initiative is doing regional intermodal planning for six New England states.

MPOs have encountered several challenges in addressing ISTEA intermodal freight requirements. They include learning about the role of freight in the economy as well as the transportation system and how important it is to conduct a good study of freight needs, how the private sector manages freight, that there is an increasing interest in freight projects but limited funding for them, and that the traditional long time frame of MPO planning versus the relatively short horizon of private-sector organizations is a major problem (GAO 1996).

ISTEA requires MPOs to increase public involvement in the planning process. To attract and retain private-sector freight participation, MPOs are realizing that they must pay attention to the reasons private-sector representatives give for participating in planning processes: raising transportation policy makers’ awareness of freight, improving the public’s knowledge, minimizing the effect of transportation problems on their businesses, having a voice in determining policies and actions, and networking.

Much progress has been made, but there is still much to be done. The National Association of Regional Councils (NARC) conducted a survey of the nation’s 342 MPOs in 1993. Of the 259 MPOs that responded, 30 percent conducted freight-related planning activities, and 39 percent reported having an ISTEA intermodal management system (GAO 1996). In a 1995 survey by the Freight Stakeholders National Network, 87 percent of the MPOs responding said that they lacked sufficient data to do adequate freight planning, and 62 percent have no routine mechanism for receiving input from the freight community. In addition, 74 percent of the MPOs had no specific freight criteria to guide project selection (Freight Stakeholders National Network 1996).

Whereas intermodalism has gained a foothold because of requirements and encouragement in ISTEA, it is still a very tenuous concept, and it has not developed strong roots. Can it survive without some requirements and support from the federal level of government?

Michael Meyer, Georgia Institute of Technology, sums it up: "Without periodic reaffirmation from the federal government that intermodalism will continue to be a cornerstone of transportation decision-making, the intermodal planning process and partnerships could fade away" (TRB 1993).

ISTEA's Intermodal Management System

Section 1034 of ISTEA required states to implement six management systems including "intermodal transportation facilities and systems." In metropolitan areas, the systems were to be developed in cooperation with MPOs. Congress gave very little direction for the management systems requirement. The only one that has any further description in the statute is the Intermodal Management System requirement. The law says, "The management system required under this section for intermodal transportation facilities and systems shall provide for improvement and integration of all of a State's transportation systems and shall include methods of achieving the optimum yield from such systems, methods for increasing productivity in the State, methods for increasing use of advanced technologies, and methods to encourage the use of innovative marketing techniques, such as just-in-time deliveries" (Public Law 102-240).

DOT's definition of the Intermodal Management System is "a systematic process of identifying key linkages between one or more modes of transportation, where the performance or use of one mode will affect another, defining strategies for improving the effectiveness of these modal interactions, and evaluation and implementation of these strategies to enhance the overall performance of the transportation system" (*Federal Register* 1993).

The interim final rule issued on December 1, 1993, required the following of a state Intermodal Management System: (a) identification of intermodal facilities and transportation systems, (b) identification of performance measures at intermodal facilities and systems, (c) data collection and system monitoring, (d) performance evaluation of intermodal facilities and systems, and (e) identification of strategies and actions that improve intermodal efficiencies. It also requires that the result of the management systems be considered in developing metropolitan and statewide transportation plans and improvement programs and in making project selections (*Federal Register* 1993).

The National Highway System Act repealed the management system requirements in response to concerns expressed by the states that the data requirements were too burdensome, the rule was too prescriptive, and the time frames for compliance were too short. Since repeal of the management systems requirement, all states are implementing some of the systems but have tailored them to their own needs. Of the six management systems, the fewest states—30 and the District of Columbia—are continuing to implement the Intermodal Management System as of September 30, 1996. Of these states, 19 indicate that they will implement the system on a statewide basis and not just locally. According to transportation officials, fewer states may be proceeding with the Intermodal Management System because the system is newer and the states are less familiar with it and because the states generally lack jurisdiction over the assets covered in this system. Also, most states did not have an Intermodal Management System before ISTEA (GAO 1997).

States are implementing the Intermodal Management System in different ways. For example, Michigan's system includes all intermodal facilities. It includes an inventory of facilities, condition identification, performance measures, needs assessment, and proposed actions. Montana's goals for its system include improving the understanding of freight issues, addressing regional and international trade issues, and providing information on freight and passenger flows. Minnesota and Idaho are developing intermodal management systems but will focus on freight issues. New Jersey will focus more on passenger issues. Illinois stated that it would develop a system but not incorporate performance measures and facility performance evaluations. Texas and Utah are not developing the system but are incorporating the Intermodal Management System into their state transportation planning efforts.

In a study done by the General Accounting Office, the states interviewed said that they need technical assistance from FHWA in areas such as developing software, implementing geographic information systems technology, establishing performance measures for systems, and integrating management systems (GAO 1997).

RESPONSE OF INTERESTED PARTIES TO THE PERFORMANCE OF ISTEA IN DEALING WITH FREIGHT PROBLEMS

ISTEA represents a major change in transportation legislation. In the Declaration of Policy and throughout the legislation, references are

made to an intermodal transportation system and the inclusion of all modes of surface transportation, including freight rail. This raised certain expectations and some fears. Some in the intermodal community expected that a wide variety of intermodal projects, including freight rail, would have significant access to ISTEA funds. Traditional highway interests benefiting from past highway funding legislation feared that already scarce resources for highway projects would be further reduced with broader access to these funds for nonhighway projects.

ISTEA did represent changes in transportation legislation and the way transportation officials thought about and approached solving transportation problems. However, many of the changes were not mandated, and many choices were left to state and local officials. Also, although there was increased flexibility in spending these funds and increased access to these funds for nontraditional highway projects, the increased accessibility continues to be limited. These limitations were particularly true for freight rail projects. The references to the inclusion of intermodal projects and particularly freight rail in ISTEA raised expectations but often were not implemented in the statutory language for a number of reasons as discussed in the opening section of this paper. Because of this and other institutional and political realities, many impediments still remain for all intermodal projects and particularly for freight rail projects. A list of some of these impediments follows.

Impediments for All Intermodal Projects

1. Financial
 - The ISTEA programs have not been fully funded.
 - Federal transportation user fees are being used for deficit reduction.
 - Projects that advance intermodalism are often large and expensive. Single-source funding does not work.
 - State and local funding is often restricted to either a particular project or by mode, and budgets are limited.
 - Investment decisions remain in the hands of modally biased agencies.
2. Institutional barriers
 - The institutions related to transportation have historically been organized around separate modes.
 - The modal agencies of DOT lack coordination.

- State departments of transportation are organized to meet the needs of separate modes.
- MPOs lack experience, tools, and technical staff to handle intermodal planning.
- There is a lack of incentives for people to learn how to connect intermodally.
- There is a lack of cooperation among government agencies and service providers.
- There is a need to create public-private partnerships between service providers, customers, and environmental groups with the goal of protecting the environment while allowing economic investments.
- Many intermodal problems and projects cover multiple states or urban areas, but there are few regional authorities to plan regional systems.
- Traditional funding mechanisms directing federal money for construction and highways are difficult to overcome. Even with ISTEA, the thinking has focused more on the ability to transfer between modes (highways and transit) than to fund the connections among modes.

3. Political

- Congress reflects modal orientation and is responsive to modal interest groups and state and local constituencies that are organized modally.
- There is competition among government agencies and congressional committees who protect their turf.
- There is a reluctance to make decisions and impose mandates that are unpopular with voters.

4. Data

- Reliable intermodal data to plan investments are lacking.
- Information for consumers in forms that enable them to make intelligent choices is lacking.

5. Technology and research

- There is a need to identify the role technologies such as ITS can play to benefit intermodal transportation.
- There is a need to determine how new technology will be made compatible with existing facilities. For example, high-speed rail is a promising technology, but how will it fit into existing rail schedules?

- DOT’s National Surface Transportation Research Plan submitted to Congress in 1993 observed that “the individual modes within DOT conduct the majority of their research independently.” This is reflected in the organization and emphasis of other public-private research institutions.

6. Education: There is a need to change how transportation professionals are educated. Michael Meyer of Georgia Institute of Technology stated, “There is a need to encourage transportation educators to incorporate intermodal considerations into the classroom. Without doing so, we perpetuate the old paradigms instead of training transportation professionals for the 21st century.”

Impediments Specifically for Intermodal Freight Projects

1. Financial

- ISTEA did not specifically make intermodal freight projects eligible for certain funding categories. There are ways to fund intermodal freight projects with ISTEA funds, but the process is more difficult. Some elements of intermodal freight transportation projects are not eligible for ISTEA funds.

- Highway projects have traditionally been funded by the Highway Trust Fund. Most intermodal freight facilities are privately owned and do not contribute fees to the Highway Trust Fund.

- The funds available for traditional highway projects are insufficient. This creates more resistance to expanding the universe of projects that have access to Highway Trust Fund money.

- A significant number of states do not permit state highway funds to be used on intermodal freight transportation projects.

- The low profitability of some transportation companies restricts their ability to invest in capital improvements and facilities.

- There are not sufficient public-private partnerships for financing capital investments in intermodal freight systems.

- State and local governments view intermodal freight as a source of revenue for them. For example, many allow sales taxes and other taxes to be levied on containers used in international commerce.

- The state often requires local government to provide the nonfederal share. Most local governments lack funds, particularly to match intermodal freight projects. This is exacerbated by the lack of multimodal trust funds at the state level, which means that

responsibility for matching intermodal freight projects is more often passed to the local level.

2. Attitudinal

- The transportation community itself is divided in its support for Highway Trust Fund eligibility of intermodal freight transportation.

- Intermodal rail service has suffered from a perception among shippers that it was unreliable for shipments that were time sensitive or susceptible to damage.

- Community attitudes toward expanding freight facilities can be negative because of perceived traffic, environmental, safety, and cost effects.

- There is a low awareness of freight in the public sector.

3. Institutional

- The private sector and government have different planning horizons. The private sector plans and executes on a relatively short time frame, whereas the public sector often requires a long time frame to plan and execute projects. Planning a large project and obtaining approvals and funding can take 15 to 20 years. Intermodal freight businesses are rapidly changing.

- There is a need for better public-private relationships that will promote the benefits of good intermodal freight transportation.

- Too often, competitive considerations among private-sector firms delay or deter intermodal freight facility improvements.

- Labor contracts can impede intermodal freight efficiencies. Some trucking companies are limited in their ability to use intermodal service because of labor contracts. There are limitations at intermodal facilities because of work rules and operating hours. There is a need to train workers who understand and are able to apply new technologies.

- MPOs have traditionally focused on passenger transportation and lack knowledge and experience with freight and intermodal transportation.

- The authority for making improvements that benefit intermodal freight often lie with local, state, and federal government rather than with owners of intermodal freight facilities.

4. Political

- Congress is reluctant to change eligibility for the Highway Trust Fund to include freight because of the strong opposition of powerful highway interest groups.

- Some in Congress with transportation jurisdiction are reluctant to share Highway Trust Fund revenues with intermodal freight because it might lead to diminished jurisdiction or might be viewed as the camel's nose under the tent to encourage even broader eligibilities beyond transportation.

- Freight interests have financed their own facilities in the past, and their main experience with government has been regulatory. This has not encouraged close public-private partnerships or working relationships. Therefore, freight transportation interests do not have the close ties or clout with local, state, and federal governments that the highway interest groups have.

5. Data

- ISTEA required the Office of Intermodalism, through the Bureau of Transportation Statistics, to develop, maintain, and make publicly available a database that includes "information on public and private investment in intermodal transportation facilities and services." To date the database has not been developed. DOT also does not track ISTEA spending on intermodal facilities, and it is difficult to find information on the amount of ISTEA funds used for intermodal freight projects.

- The data available on intermodal freight transportation are insufficient.

- The private sector is hesitant to give public-sector officials access to data on freight movements that may be proprietary. Some intermodal freight data are not available in a usable form or are not available at all.

6. Technology and research

- The governmental research focused on technologies that will benefit intermodal freight transportation is insufficient.

- Information and technical assistance are not effectively disseminated.

7. Education: Policy and decision makers, the general public, government agencies, and transportation professionals lack knowledge about intermodal freight transportation.

8. Regulatory

- Federal, state, and local regulations governing intermodal freight transportation are not uniform. Examples include regulations on truck size and weight and access, taxes and fees, noise, and land use.

- Regulations often delay or increase the cost of building new intermodal freight facilities. There can be a long lead time for environmental clearances, planning requirements, and approvals.

- Because transportation is modally organized, intermodal transportation is more difficult because intermodal projects are often governed by more than one agency and the regulations are often conflicting. Intermodal projects are more complex and often do not fit into any of the boxes.

9. Operational

- Freight tracking systems at intermodal facilities are often not compatible.

- There is a need for extending double-stack service and customs preclearance, scheduling equipment usage, managing the flow of containers, improving the coordination of modes, addressing inadequate terminal operating hours, improving management capabilities, and addressing the low profitability of terminal operations.

- Infrastructure needs include state-of-the-art terminals, adequate clearances and weight capacities for bridges, increased water depths at ports, grade crossing separation or elimination, and adequate highway and rail access to terminals and ports.

- Major congestion problems with access routes, bridges, tunnels, and rail lines create bottlenecks because of inadequate capacity. There is congestion at international ports and border crossings.

- Equipment utilization is inefficient for intermodal freight transportation. Countries do not allow use of foreign vessels, trucks, containers, or chassis for domestic moves (Public Law 102-240; U.S. House of Representatives 1991; National Commission on Intermodal Transportation 1994; Eno Foundation 1994).

Overall, the implementation of ISTEA concerning freight rail projects reflects the statutory language. Whereas there were a significant number of references in ISTEA to intermodalism and freight rail, many of these references were included in language outlining policy but with no force of law. The language may have raised unrealistic expectations in some cases in the intermodal and freight rail communities. But the language also conveyed the desire of Congress to see a more integrated transportation system in this country and emphasized

Congress's view that such a system would benefit the country. It has focused attention on intermodal transportation and encouraged states and localities that were already taking an intermodal approach to continue doing so. Other states and localities are taking an intermodal approach to solving transportation problems for the first time because of the encouragement in ISTEA to do so. Again, the intent of ISTEA was to encourage an intermodal approach to transportation, including freight rail, rather than mandating such an approach.

Comparison with Other Countries' Intermodal Policies

Because of the significant role transportation plays in the world economy, it is important to know how other countries are solving their transportation problems. Other countries, particularly those in the European Community, have recognized for a number of years the importance of an integrated transportation system and have emphasized intermodal transportation.

To maintain our country's competitiveness, we must know what other countries are doing. There are opportunities to exchange information with other countries and to observe what works well. Compatible information links must be developed if there is going to be a seamless transportation system not only in this country but worldwide. See Appendix 3 for further discussion of other countries' intermodal policies.

Freight-Related Projects That Could Be Funded with Federal Aid

Whereas a supporter of funding any type of freight-related project with federal-aid transportation funds could be found somewhere, the following observations are representative of most states, local governments, and private-sector groups:

- International trade/border crossings/operational costs: "Federal border officials in Laredo observed that increased funding for operating personnel, which will allow border crossings to be open longer hours, would provide adequate border crossing capacity at lower cost

than a new bridge” (National Commission on Intermodal Transportation 1994).

- Intermodal/intermodal freight facilities: The flexibility promised by ISTEA has not yet been fully realized. According to Susan Stauder of the Bi-State Development Agency of St. Louis, “ISTEA gives direction to be intermodal, but funding still comes out the old way—via modal silos.” Linda Bohlinger of the Los Angeles Metropolitan Transportation Authority indicates that “the flexibility message has not really trickled down.”

Traditional funding systems put intermodal projects at a significant disadvantage. Paul Kaftanski, Transportation Manager for the city of Everett, Washington, described difficulties trying to fund construction of bus bays at the city train station: “FHWA said it wasn’t a highway project. The Federal Transit Administration told me it wasn’t a transit project” (National Commission on Intermodal Transportation 1994).

Specific freight intermodal projects have sought federal funding. The Alameda Corridor in Los Angeles, California, and the Central Artery in Boston, Massachusetts, have sought special provisions and demonstration project funding. CSX in Maryland and the P&W Railroad in Rhode Island both need a third track to avoid congestion between freight and passenger rail service. Rail infrastructure, particularly that portion connecting to ports, which has not been significantly expanded in a half century and now handles a fourth of U.S. trade, and projects removing impediments to double-stack have sought funds.

- Regional/national priority facilities: According to Jean Godwin, representing the American Association of Port Authorities, “It appears that under ISTEA, national priorities are in danger of being lost in the current decision-making framework at the MPO level. We are concerned that freight projects that support the Nation’s global competitiveness must continue to compete for funds under a process that inherently favors more popular local passenger and transit projects.” According to John Glover of the Port of Oakland, “The problem with the current ISTEA process is that projects such as freight rail improvements that contribute to the economic vitality of the Nation, but do not have obvious benefits to their immediate local or regional areas, are penalized. Priority and funding need to be established for nationally significant projects” (National Commission on Intermodal Transportation 1994).

Positions of Interested Parties on Freight Provisions and Federal Legislation

The legislative process is shaped and influenced by federal, state, and local government agencies responsible for implementing the program and by affected and interested parties in the private sector. Therefore, the views of these entities and their support for or opposition to various legislative proposals will affect the final form of the legislation. The positions of government agencies and private-sector groups often indicate the direction legislation will take.

Within the transportation community there are differing views regarding intermodal and freight rail transportation and public policy. This is particularly true when it comes to determining the amount of federal funds that should be made available for freight rail projects from the Highway Trust Fund. The use of Highway Trust Fund money for “non-highway projects” such as intermodal freight rail projects, the amount of federal funds that should be targeted at transportation spending, public-private financing partnerships, the flexibility of using federal transportation dollars, and who determines project selection are ongoing issues. Following is a list of the key policy issues that will be discussed extensively as transportation legislation is debated over the next decade. The current policy positions of representative transportation interest groups are briefly presented. The information comes from a compilation done by the U.S. Department of Transportation and from policy statements from individual groups. See Appendix 4 for a key to organizations.

The U.S. Department of Transportation has put forth eight principles of federal freight transportation policy as follows:

1. Provide funding and a planning framework that establishes priorities for allocation of federal resources to cost-effective infrastructure investments that support broad national goals.
2. Promote economic growth by removing unwise or unnecessary regulation and through the efficient pricing of publicly financed transportation infrastructure.
3. Ensure a safe transportation system.
4. Protect the environment and conserve energy.
5. Use advances in transportation technology to promote transportation efficiency, safety, and speed.

6. Effectively meet our defense and emergency transportation requirements.
7. Facilitate international trade and commerce.
8. Promote effective and equitable joint utilization of transportation infrastructure for freight and passenger service (DOT 1996b).

The views of other groups follow.

1. Intermodal freight project eligibility for highway funds: Several organizations including STPP, IANA, and AAPA support intermodal freight eligibility for highway funds. Several highway-related groups including ATA, AHUA, and ARTBA oppose spending Highway Trust Funds for anything but highway projects. AAR also opposes the use of trust fund revenues for freight rail projects because of the fear of having to pay a user fee into the trust fund but favors the use of these funds for improving intermodal connectors.

Most organizations are in between these two positions, favoring investment in intermodal freight transportation in some cases but probably not in all. NCSL believes federal funds should foster connectivity and multimodality. AASHTO says public investment in transportation infrastructure should augment and leverage private-sector investment and promote a competitive free-market atmosphere for freight transportation.

The National Commission on Intermodal Transportation report urges that restrictions on uses of federal trust funds be minimized to allow states and MPOs the opportunity to evaluate investment decisions across modes and make modal trade-offs. Eligible projects should include connectors that link the NHS with ports and terminals, multimodal terminals, and rail and highway projects that increase system capacity.

The TRB Committee for Study on Landside Access to Ports recommends that projects including dedicated freight corridors to terminals, on- or near-terminal rail service, the development of inland intermodal terminals, and rail-highway crossing improvements be eligible.

2. Increased funding for transportation programs: All groups with an interest in ISTEA reauthorization support full funding of the program or increased funding. Most support taking the Highway Trust Fund off budget or finding some way to spend all the highway fees that are collected. Several groups including AASHTO, AHUA, and Keep America Moving propose targeting 85 percent of the funds to the

National Highway System, bridges, safety, research and development, and roads on federal lands. This leaves 15 percent for the Surface Transportation Program's currently eligible projects and would drastically reduce the funds available for projects directly benefiting intermodal freight transportation.

3. Strong state and metropolitan planning provisions: Several organizations, including AAR and AASHTO, have stated that they support including the consideration of intermodal freight in the planning process.

Some groups will support the process but want changes made. IANA believes that MPOs should be required to include freight interests on their policy and technical committees and that each MPO should create a freight movement task force. ATA wants the MPO/freight planning process streamlined to decrease delays and wants the planning process to be more responsive to freight needs.

A number of groups including STPP, NARC, USCOM, NLC, APA, and APWA support the continuation of the MPO's role in project selection.

AAPA will support the MPO project selection structure in ISTEA if the following changes are made to benefit freight: MPOs should be required to develop a 5-year capital improvement plan to identify high-priority freight mobility projects. Plans must be developed in conjunction with local freight interests and must include a market analysis. MPOs with a public port authority within their boundaries should be required to include the port agency as a voting member of the MPO. MPOs should be required to have freight interests of all modes represented on their policy and technical committees and should encourage the creation of goods movement task forces.

IANA wants a mandate that states and MPOs, in their project selection criteria, equitably consider freight transportation projects and include the direct and indirect economic benefit of projects including job creation, congestion reduction, and enhancement of freight mobility.

APWA supports providing MPOs with authority to integrate the NHS with "other public and private modes, metropolitan systems, and rural roads."

4. Maintain funding flexibility in ISTEA, particularly CMAQ and Transportation Enhancement (TE) categories: The CMAQ and TE programs have been a source of funds for intermodal freight projects. Their continuation is supported by STPP, APWA, ITE, NARC,

NCSL, and NLC. Several groups including AHUA, Keep America Moving, AGC, AASHTO, ATA, and ARTBA support eliminating these programs.

Groups strongly supporting the existing funding flexibility in ISTEA include AASHTO, STPP, AAPA, IANA, APA, and ITE. NACo and NARC support providing state and local agencies with the ability to use federal funds for capital, maintenance, and operating costs for all surface transportation programs.

5. Expand innovative financing: There is broad support among transportation groups for exploring innovative financing and at least making some options available. AAPA specifically recommends that the government provide innovative financing for projects of regional and national significance, enhance flexible funding for port infrastructure projects by expanding the use by public agencies of tax exempt bond authority for cargo transportation purposes, and permit the use of private activity bonds to finance trackage and rail facilities, in addition to docks and wharves, in limited circumstances. IANA supports encouraging innovative public-private partnerships to finance projects that might otherwise not be built that will enhance the nation's transportation network.

The TRB Committee for Study on Landside Access to Ports recommended that states consider establishing multimodal transportation trust funds to provide a funding source for port access needs. APWA wants legislation to allow states and local governments to include privatization, public-private partnerships, ITS, joint development projects, and public agency toll pricing.

ACEC and AGC support innovative financing as a supplement to the fuel tax, and AHUA supports the use of innovative financing techniques to leverage additional infrastructure funds from the public sector, but for highway and bridge projects only.

6. Retain the "I" in ISTEA: There is a wide recognition in the transportation community that intermodal data are inadequate. AASHTO has supported the collection of such data. Private-sector groups acknowledge the problem but are worried about proprietary issues and burdensome requirements.

Most transportation interest groups including AASHTO, STPP, APWA, NATAT, and NCSL support the intermodal goals of ISTEA and support an integrated transportation system.

STPP and USCOM have expressed support for an intermodal emphasis in research.

AASHTO believes that the unimpeded flow of domestic and international trade should be facilitated through uniform administrative procedures and regulations. The National Commission on Intermodal Transportation says that it is essential that DOT take the lead in rationalizing the relationship between the DOT review of transportation projects and their review by other federal agencies.

IANA suggests enhancing the authority of DOT's Office of Intermodalism by creating an Intermodal Joint Program Office and vesting it with statutory authority for coordinating the intermodal activities of all DOT agencies on matters involving people and freight movement.

7. Provide federal funds for projects of national significance: The National Commission on Intermodal Transportation recommends supporting federal funds for projects of national significance. NACTO and AAPA support special provisions for nationally significant projects, such as certain intermodal facilities that support international trade.

CONCLUSIONS AND RECOMMENDATIONS

ISTEA represented major changes in how the transportation system is viewed in this country. Responding to limited financial resources and to states and localities that wanted flexibility to make choices to solve transportation problems, Congress concluded that it was important to view the country's transportation system as an integrated, intermodal system. There were many differing views on how to implement such a system. The final ISTEA legislation was a compromise addressing these differing views. Major steps were taken toward intermodalism and recognizing the importance of freight rail transportation. In some cases, expectations were raised that could not be carried out in the implementation of the legislation. The debate as to the role of the federal government in freight rail transportation will continue. Changes in this area often come incrementally. Not all transportation issues should be solved through legislation—very few should be addressed by federal legislation.

Recommendations for the intermodal freight transportation community to consider for future legislative changes follow. The list is not exhaustive. The recommendations are a response to the views of various transportation interests, to the impediments that still remain, and to the recommendations other study groups have proposed. They reflect the author's views of steps that can be taken to benefit freight

rail and build on the intermodal transportation principles set forth in ISTEA. Not all recommendations will find support in the wider transportation community or even in the intermodal freight transportation community. It is hoped that they will generate discussion and additional ideas within the transportation community to determine whether these or other solutions will benefit intermodal freight rail and the entire transportation system in this country.

Financial: Transportation demands have exceeded resources for many years, and the gap is likely to continue. When there are not enough revenues to go around, there is greater resistance to expanding eligibility for funds. This, together with the fact that historically highway user fees have been used only for highways, will make it difficult to direct large amounts of federal funds to intermodal freight transportation projects. To make resources go further, however, transportation must be managed as an intermodal system. Additional resources must be found that will benefit the entire system.

Intermodal freight can lead the way in this area because it has had to put together financing packages on its own for many years. This reflects how many transportation projects will have to be financed in the future—through financing packages with funding from many sources.

Recommendations:

- Have a transportation summit so that the transportation interest groups can agree on areas where federal funds should advance good intermodal freight projects that will benefit the country's transportation system and that cannot be done without federal assistance.
- Provide members of Congress with good intermodal freight projects—ones that meet criteria for “projects of national significance”—for them to support as the inevitable demonstration projects in their district or state.
 - Provide incentives for states to establish multimodal transportation trust funds in order to provide a funding source for intermodal freight projects.
 - Work for the expansion of innovative financing.
 - Craft an innovative financing pilot program for intermodal freight or ensure that any generic pilot programs include intermodal freight.
 - Support efforts to increase funding for transportation.

Retain the “T” in ISTEA: The direction given by ISTEA—to consider all modes of transportation and their connectors in the planning process

and to think of the system as an intermodal transportation system—gave intermodal freight transportation an opportunity to have a seat at the decision-making table. Without these requirements, transportation decision makers will return to modal biases.

Recommendations:

- Support a federal role in requiring states and localities to develop an intermodal transportation system.
- Direct DOT to institute management and organizational changes that will result in a coordinated intermodal transportation system.
- Give DOT's Office of Intermodalism more funding and more authority to conduct studies on intermodal routes and facilities important to interstate and international commerce; make collection of freight data a high priority; determine where federal funds are used on intermodal freight transportation projects; and provide information and training about intermodal freight transportation to federal, state, and local officials, transportation professionals, and the general public.
- Require DOT, in cooperation with states, local governments, transportation providers, and the private sector, to develop a National Intermodal Transportation System. This should not necessarily be a map but rather an inventory of critical corridors and facilities.
- Reinstate a requirement that states carry out an Intermodal Management System. Whereas the way it is done should not be prescribed, managing an intermodal system should be mandatory. It will at least encourage people to think about intermodal freight transportation.

Maintain and expand flexibility: Flexibility in spending federal funds on strategies that will solve transportation problems rather than directing funds at narrow project categories gave intermodal freight projects access to ISTEA funds. In particular, the CMAQ program and the Surface Transportation Program and its transportation enhancement set-aside have provided funding for intermodal freight projects. Without these kinds of flexible programs, intermodal freight transportation projects will have no access to transportation funds.

Recommendations:

- Maintain flexibility in the federal transportation program. Ideally, flexibility should be expanded to specifically include intermodal freight transportation projects as eligible for federal transportation funds.

- Continue the Surface Transportation Program, the TE set-aside, and the CMAQ program, or a similar flexible program. Express to Congress the intermodal freight transportation community's strong support for the broad eligibility of these categories and why it is important to the economic health of the country.

Participate in the decision-making process: Intermodal freight has benefited from ISTEA. Many intermodal freight projects contain a highway element that can be funded through ISTEA and advance an intermodal freight project. Freight facilities also derive benefit from most highway projects. Even limited directives in ISTEA, particularly the state and MPO planning requirements, have given freight interests opportunities to establish public-private working relationships and to educate transportation decision makers. This can lead to solving problems often without mandates or formal structures.

Recommendations:

- Emphasize elements in the transportation program that benefit intermodal freight and insert wherever possible language that will benefit or include intermodal freight even in a small way.
- Have an active, daily presence in Congress during any legislative process related to transportation. Initiate contacts and, at every opportunity, give Congress specific suggestions that will benefit intermodal freight.
- Retain the planning process in ISTEA. Ideally, MPOs and states should be required to include freight interests in the decision-making process.

Education: ISTEA introduced a new way to think about transportation—intermodally. Transportation decision makers have been thinking and acting modally throughout the long history of government involvement in transportation. ISTEA has sown the seeds of change, but much more effort will be required before intermodalism becomes firmly rooted in the thinking and actions of transportation decision makers.

Recommendations:

- Teach transportation officials to think and act intermodally, rather than modally, beginning in the institutions that educate transportation professionals.

- Educate state and local officials about the value of freight transportation. Require each effort authorized in ISTEA undertaken by DOT related to education—the National Highway Institute, the International Highway Transportation Outreach Program, the University Transportation Centers, and the Education and Training Program, for example—to include intermodal freight transportation elements.
- Create several pilot programs through public-private partnerships to educate people about intermodal freight in academic settings and government agencies.

Research and data collection: Intermodalism will have to deliver on its potential benefits: lowering transportation costs, reducing energy consumption, improving air quality and reducing environmental effects, reducing traffic on congested infrastructure, and providing better transportation service for shippers. Without adequate research and data collection, this will not happen. Decision makers need adequate data and research to demonstrate and defend successful approaches.

Recommendations:

- Review DOT's research program, particularly the ITS research program, and require that research benefiting intermodal freight transportation be included.
 - Develop tools that will identify and measure the benefits of intermodal operational improvements on the system.
 - Require the federal government to bring together the parties involved in the use of technologies such as information systems to define needs, promote standardization, and encourage research on and dissemination of innovation for intermodal freight transportation.
 - Require the Bureau of Transportation Statistics and the Office of Intermodalism to collect and disseminate data on intermodal freight transportation.
 - Examine what other countries are doing with intermodal freight transportation and financing mechanisms.

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Abbreviations

DOT U.S. Department of Transportation
FHWA Federal Highway Administration

GAO General Accounting Office
TRB Transportation Research Board

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APPENDIX 1

SUMMARY OF ISTEA PROVISIONS AFFECTING FREIGHT

1. Section 2, the Declaration of Policy, recognizes the importance of intermodal freight transportation. It describes an Intermodal Transportation System as one that will “move people and goods in an energy efficient manner,” “promote economic development and support the Nation’s preeminent position in international commerce,”

and “provide improved access to ports and airports, the Nation’s link to world commerce.”

2. Section 1005(g) adds new eligibility for startup costs for traffic management and control projects. Initial costs such as labor, administration, rent, and utilities are eligible for integrated traffic control systems, incident management programs, and traffic control centers. The goal of this section is to reduce congestion, which should enable freight to move faster.

3. Section 1006 creates the NHS, the purpose of which is to “provide an interconnected system of principal arterial routes which will serve major population centers, international border crossings, ports, airports, public transportation facilities, and other intermodal transportation facilities and other major travel destinations; meet national defense requirements; and serve interstate and interregional travel.”

NHS funds are generally available for road and bridge construction and rehabilitation projects on designated NHS roads only. NHS funds, however, can be used on any public highway connection to a major intermodal terminal. Improvements necessary to accommodate other modes, including rail, are also eligible. Whereas the term “accommodate other modes” has not been defined in regulations, FHWA issued a memorandum on February 9, 1993, providing guidance on eligibility. The memorandum states that FHWA views this new “accommodation” feature of Title 23 “as allowing use of the designated Federal funding sources to pay for adjustments to highway elements to accommodate a rail line. This might include lengthening or increased vertical clearances of bridges, adjusting drainage facilities, lighting, signing or utilities, or making minor adjustments to highway alignments.” The memorandum goes on to say that accommodation does not allow use of funds to purchase right-of-way for a rail line, relocate a highway, or construct the rail line if the primary function is related to an adjacent rail line. However, the memorandum states, “Where an existing highway facility directly constrains operations of an existing rail line (for example, a highway structure with limited vertical clearance over a rail line may not allow for double-stack rail operations), adjustments to the rail line including relocation of the line and purchase of right-of-way would be an allowable use of Federal funds where it can be shown to be more cost-effective than eligible adjustments to the existing highway facility.”

4. Section 1007 establishes the Surface Transportation Program and the Transportation Enhancements program. Projects eligible for STP funds include construction, reconstruction, rehabilitation, resurfacing, restoration, and operational improvements for highways and bridges; construction or reconstruction necessary to accommodate other transportation modes (see NHS eligibility discussion in Item 3); capital and operating costs for traffic monitoring, management and control facilities, and programs; highway-rail grade crossing improvements; and improvements to any highway link or connection benefiting intermodal movements.

ISTEA requires states to spend 10 percent of STP funds for transportation enhancements. Ten categories of projects are eligible for enhancement funds, including several that can benefit intermodal freight transportation: (a) rehabilitation and operation of historic transportation buildings, structures, or facilities (including historic railroad facilities), and (b) preservation of abandoned railway corridors.

5. Section 1008 creates the CMAQ program. Eligible projects include those that the Secretary of Transportation and the administrator of the Environmental Protection Agency determine will have air quality benefits. The statute refers to transportation projects rather than highway projects in this section, which allows FHWA to permit broader project eligibility under the CMAQ program. Guidance from DOT for CMAQ eligibility indicates that CMAQ funds can be used for a rail improvement as long as "emission reductions can reasonably be expected." Support for intermodal freight facilities and public-private initiatives has been directly expressed in revised guidance issued in 1995 and 1996.

6. Sections 1024 and 1025 modify the MPO and the state planning requirements, respectively. MPOs, in cooperation with the state, are directed to "develop transportation plans and programs for urbanized areas. Such plans and programs shall provide for the development of transportation facilities which will function as an intermodal transportation system for the State, the metropolitan area, and the Nation. The process for developing such plans and programs shall provide for consideration of all modes of transportation. . . ." The state is directed to develop transportation plans and programs that will benefit the entire state. The plans should result in transportation facilities that function as an intermodal state transportation system.

In developing these programs and plans the MPOs must consider a number of factors including two directly related to intermodal freight

transportation: "international border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes," and "methods to enhance the efficient movement of freight." The state planning process must consider "international border crossing and access to ports, airports, intermodal facilities, major freight distribution routes"

7. Section 1034 created the Intermodal Management System requirement. Although the mandatory nature of this requirement was repealed in the NHS bill, 30 states and the District of Columbia are continuing to implement this system. The original provision directed that the Intermodal Management System "provide for improvement and integration of all of a State's transportation systems and include methods of achieving the optimum yield from such systems, methods for increasing productivity in the State, methods for increasing use of advanced technologies, and methods to encourage the use of innovative marketing techniques, such as just-in-time deliveries."

8. Section 1108 provides \$437 million for Priority Intermodal Projects that have intermodal transportation benefits. ISTEA provided more than \$6 billion over 6 years for general demonstration projects. Many will provide some benefits to the movement of freight.

9. Title V is the Intermodal Transportation title. It establishes intermodalism as the policy of the United States Government and an Office of Intermodalism within the Office of the Secretary. The director of this office is responsible for collecting and disseminating data through the Bureau of Transportation Statistics, coordinating federal research on intermodal transportation, and providing technical assistance to states and MPOs.

Title V provides grant money to states for developing model state intermodal transportation plans. It requires the National Academy of Public Administration to study the organization of DOT. Finally, it established a National Commission on Intermodal Transportation to make a complete investigation and study of intermodal transportation in the United States. The commission issued a comprehensive report in September 1994.

10. Title VI provides funding for several research and education programs. Section 6002 funds the National Highway Institute, which provides training programs for transportation professionals. Section 6003 creates the international highway transportation outreach program, whose activities include collecting and distributing informa-

tion about highway transportation innovations in other countries that could be useful in the United States. Section 6004 establishes an education and training program. The Secretary may make grants for education and training, technical assistance, and related support services that will benefit transportation, including those that will enhance programs for the movement of passengers and freight. Section 6006 creates the Bureau of Transportation Statistics, which is to compile transportation-related statistics and information. Specifically, statistics should be in a form permitting cost-benefit studies comparing individual transportation modes with intermodal transportation systems. Section 6009 requires the Secretary to submit an annual report to Congress on surface transportation research and development planning. The Secretary is required to develop an integrated national surface transportation research and development plan. Section 6023 provides funds for University Transportation Centers. These funds enable universities to carry out transportation research.

Part B of Title VI establishes the Intelligent Vehicle-Highway Systems research program (subsequently changed to the Intelligent Transportation Systems program). The ITS program is directed to promote compatible standards and protocols, develop evaluation guidelines for ITS operational tests, and establish an information clearinghouse. The ITS program has funded and developed the technologies that support the Commercial Vehicle Operations effort.

APPENDIX 2

USE OF ISTEA TO SUPPORT FREIGHT-RELATED PROJECTS

- NHS: \$21 billion over 6 years. The Philadelphia, Pennsylvania, Tioga Marine Terminal is a water/rail/highway intermodal transfer facility. Improvements to remove impediments to highway access were undertaken. NHS funds were used for signaling and turning radius improvements.
- CMAQ program: \$6 billion over 6 years.
 - A new intermodal terminal for northern New England in Auburn, Maine, will provide rail service that will link New England with Chicago, Detroit, and Buffalo.

- The Red Hook Container Barge Service in New York City provides access for the cross-harbor movement of intermodal freight by water ferry, providing an alternative to truck drayage.
- Columbia Slough Intermodal Expansion Bridge will provide a rail access bridge to the Port of Portland, Oregon.
- Fairfield Truck to Rail Transfer Facility in Auburn, Maine, will build parking, storage, and staging areas to move containerized cargo from truck to rail and vice versa.
- CP Rail is reengineering its Bensenville yard in Chicago to reduce traffic conflicts with fewer grade crossings.
- Stark County Intermodal Facility in Ohio will enable truck trailers and freight containers to be loaded onto railroad cars rather than travel by truck. CMAQ funds are loaned through a transportation revolving loan fund.
- Cincinnati Third Rail Line will relieve freight train congestion in Cincinnati and reduce highway truck traffic.
- Morristown Branch Line in New Jersey is rehabilitating a branch line to provide service to a regional distribution center.
- Gorham Railroad Bridge Project in Gorham, Maine, is a bridge clearance project to provide double-stack service. It will reduce emissions along the I-95 corridor.
- STP: \$23.9 billion over 6 years.
 - The Port of Seattle in Washington is building an intermodal bridge to bring rail services into the port. For the grade-separated highway portion of the bridge, \$2.5 million of STP funds is being used.
 - Ventura County, California, is purchasing abandoned and existing rail corridors to replace some truck movements. To acquire the rail branches, \$4.2 million in STP funds and \$3.5 million in STP Enhancement funds are being used.
 - Delaware Avenue Intermodal Improvements in Philadelphia, Pennsylvania, are roadway improvements to help traffic flow and safety on Delaware Avenue, which provides access to the Ameriport Intermodal Facility and the port.
 - The Port of Oakland Intermodal Terminal project in California consolidates intermodal operations of three railroads in a single terminal with advanced computer equipment to interface with railroads and customers. STP funds were used for initial studies.

- Santa Teresa Intermodal Facility in Santa Teresa, New Mexico, is a proposed new intermodal facility that will apply advanced technology to speed truck and rail freight between New Mexico and Mexico. STP funds were used for planning and research.
- Fort Collins Track Consolidation Project in Colorado will consolidate and relocate rail track, eliminate grade crossings, and add signals.
- The Tchoupitoulas Corridor Project in New Orleans will provide a roadway that will improve access into the port while removing truck traffic from city streets.
- STP Transportation Enhancements: \$2.3 billion over 6 years.
 - The Ohio/Panhandle Rail Line in southeastern Ohio used STP enhancement funds to purchase and operate a rail freight corridor. If the rail corridor is ever abandoned, a bikeway trail must be developed in the corridor.
 - Georgetown Loop Bridge in Georgetown, Colorado, recreates a historic bridge as part of reconstruction of a 19th-century narrow-gauge mining railroad.
 - Danville Rail Passenger Station and Science Center in Danville, Virginia, restores a historic rail passenger building, freight depot, and railroad trestle. (Although the Georgetown and Danville projects are not related to current freight movement, they interpret freight transportation history to the public and may increase the public's appreciation of the role freight transportation has played and will continue to play.)
- Bridge program: \$16.1 billion over 6 years. Any bridge on a public road is eligible. Activities to accommodate truck or rail freight movements are eligible, including bridge clearance projects.
- Demonstration project funds: \$437 million for priority intermodal projects.
 - Alameda Corridor project in California will connect the Ports of Los Angeles and Long Beach to rail yards. The rail facilities will be improved, and a track that is 32 km (20 mi) long will be grade separated.
 - North Carolina Rail Line Improvements will improve grade crossings on a designated high-speed rail corridor and perform limited track work.
 - Jacksonville Interchange in Florida will link the seaport, airport terminal, and an Interstate road in Jacksonville.

- The Lafayette Rail Relocation relocates a railroad in Lafayette, Indiana.
- Other projects include the Columbia Slough Intermodal Expansion Bridge in Portland, Oregon, and the Delaware Avenue Improvements projects in Philadelphia, Pennsylvania.
- Planning and research funds: PennDOT coordinated a project to remove impediments to double-stack rail operations serving the Port of Philadelphia. Funds were used for PennDOT's study of project benefits and costs.
- Mixture of ISTEA funds:
 - The Philadelphia MPO identified impediments to highway access at the Philadelphia Tioga Marine Terminal from I-95. NHS, safety, and STP funds are being used for signaling and turning radius improvements.
 - Santa Teresa Intermodal Facility will apply advanced technology to speed truck and rail freight between New Mexico and Mexico. Demonstration project, ITS, and STP funds have been used for initial feasibility studies, preliminary engineering, and environmental work.
- Innovative financing projects: In 1994, President Clinton issued Executive Order 12893, "Principles for Federal Infrastructure Investments." Secretary Peña established DOT's innovative financing initiative, the Partnership for Transportation Investment.
 - Cincinnati Third Rail Line: Norfolk-Southern provided upfront financing and the Ohio Department of Transportation provided its share through partial reimbursement over several years by advance commitment of CMAQ funds.
 - Fairfield Intermodal Facility in Maine used the credit for private investment toward the state share. A private share of 45 percent was proposed, which includes contributions of materials and equipment.
 - Quonset Point Rail Track in Rhode Island proposes to use advanced construction federal funds from FHWA to be paid back over a 15-year period (FHWA 1995, TRB 1996).
- State Infrastructure Banks:
 - The California SIB would provide a credit enhancement to Caltrans and a private consortium to support privately issued revenue bonds. The bonds will be repaid through cargo fees.

- The Missouri SIB is considering assistance to a parking facility for the Gateway Multimodal Center by providing a loan that would be repaid by parking and concession fees (DOT 1996).

APPENDIX 3

COMPARISON WITH OTHER COUNTRIES' INTERMODAL POLICIES

For several years European countries, particularly those belonging to the European Community (EC), have recognized the importance of improving economic, environmental, and social conditions through a strong, integrated transportation system. All levels of government in the European countries support intermodal freight transportation policy planning and program development, and it is being done in a way to benefit economic, social, and environmental needs. This is all being done despite tremendous cultural and national differences. The EC's planning process involves public-private interaction and dialogue. Public funds from the EC to member governments for intermodal infrastructure are provided to encourage a shift from modal to intermodal systems. Within member countries, funding goes to the most effective transportation investment, regardless of mode.

Sustainable mobility has become the guiding force for transportation policies at the EC and within many member countries. "Quality-of-life" and environmental constraints drive transportation policies and investment decisions. Rail, highway, water, and air modes are viewed as equal members in the transportation equation. Along with addressing internal issues in each country, there is a strong commitment to plan for efficient freight transportation at the EC level to maintain its share of the world market. Governments in Europe share the risk with the private sector, particularly for the more innovative intermodal systems that are high-risk investments.

Trans-European networks have been developed for both modal and intermodal systems. The networks provide a focus for targeted EC investment and also a common level of standards for infrastructure, equipment, and operations. All levels of government recognize the

importance of freight transportation. The first major policy area being pursued by the EC to encourage more integrated transportation is to establish a level playing field within and across modes. The EC also is working hard at harmonizing standards (DOT 1994).

According to John Hugh Rees, Railways, Combined-Transport and Waterways Division, Commission of the European Union, "The problem comes back to management, the problem comes back to the industry. Is the industry going to be capable of accepting this challenge? From the public sector, we are prepared to help with aid. We are prepared to intervene in the market. We are prepared to give subsidies to develop combined-transport, to develop intermodal transport . . . Will the various managers in the different modes be prepared to work together? We would like to get them into a situation where they think that working together is going to make everyone better off, rather than someone worse off. If we can do that, I think we can succeed" (TRB 1996).

In the Netherlands, strong direction, comprehensive planning, and truly intermodal funding are provided at the central government level, and the program is complementary to the greater EC program.

Germany recognizes the danger of complacency when it comes to transportation policies and, therefore, is making changes. Forces driving these changes include modernization of the eastern states' transportation infrastructure, changes in industry, the opening of trade with Eastern Europe, and the fact that environmental concerns influence much of the decision making. To meet these challenges, one of the first goals is to improve cooperation between interests favoring economic development and the environment. It is also evident that both government and industry are willing to make major investments in intermodal transportation (DOT 1994).

Gianni Migliorino of Viamare S.p.A., Genoa, Italy, reports that "throughout Europe, there is a call for change, induced by growing difficulties from the recessionary economic cycle and at the same time by increasing awareness of environmental issues. . . . Today, the following aspects appear to be of paramount importance: the creation of intermodal networks by linking infrastructures and transport means, and the creation of parallel information chains, which have become the major source of added value" (TRB 1993).

APPENDIX 4

KEY TO ORGANIZATIONS

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AAPA	American Association of Port Authorities
ACEC	American Consulting Engineers Council
APWA	American Public Works Association
ATA	American Trucking Associations
AHUA	American Highway Users Alliance
ARTBA	American Road and Transportation Builders Association
AGC	Association of General Contractors
IANA	Intermodal Association of North America
ITE	Institute of Transportation Engineers
NACo	National Association of Counties
NACTO	National Association of City Transportation Officials
NARC	National Association of Regional Councils
NATAT	National Association of Towns and Townships
NCSL	National Conference of State Legislators
NLC	National League of Cities
STPP	Surface Transportation Policy Project
USCOM	U.S. Conference of Mayors

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Abbreviations

DOT	U.S. Department of Transportation
FHWA	Federal Highway Administration
TRB	Transportation Research Board

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Freight Projects of National Significance: Toward a Working Definition

Daniel Smith, The Tioga Group

The earliest government involvement in freight transportation was prompted by the industrial and agricultural development of the new nation. The linkage between freight transportation and prosperity was well accepted, although promised benefits did not always materialize. In recent years freight transportation has once again been recognized as a central element in long-term economic efficiency and competitiveness, and government interest has reawakened. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) was the first major attempt to embrace intermodal and multimodal issues. To continue the work begun under ISTEA—in NEXTEA or whatever legislative form a successor takes—the federal government needs a reliable means to identify and prioritize the most important intermodal freight projects.

The National Commission on Intermodal Transportation indicated that “the national intermodal transportation system should ensure funding of projects of national or regional significance” (National Commission on Intermodal Transportation 1994). Defining “projects of national significance” in a way useful to funding agencies and planners is not easy. What do we need to derive a working defini-

tion of “projects of national significance”? Surprisingly enough, there is little we can take for granted:

- We need help in defining a “project.”
- We need help in identifying a “national” project.
- We need help in measuring national “significance.”

Experience under ISTEA indicates that even the long-standing process of designating and prioritizing traditional passenger projects is awkward at best and that meritorious freight projects can come in many shapes and sizes. In this paper several candidate projects will be examined to illustrate the range that may be encountered and the issues involved in attempting to define and locate others.

The primary objective of a working definition is not theoretical or political correctness but usefulness in helping find and support the most cost-effective freight transportation projects. Whereas any definition of projects of national significance should be theoretically correct, practicality is crucial. A successful working definition must also be broadly applicable, must aid planners in locating candidates, and must facilitate prioritization.

We might start with an informal understanding that “project of national significance” means “a big project with lots of net benefits that justify federal funding.” Such an informal understanding can go a long way if all the candidates are clear-cut examples of familiar types. But when we fulfill our public obligations by rigorously seeking the best use of public funds, we need a more robust definition that can serve us well in unfamiliar and ambiguous territory.

Even with a working definition in hand there are many issues to be faced in locating such projects and measuring their significance. Several of these issues are discussed, and key barriers and needs are identified. Two basic approaches are described and compared. Finally, conclusions concerning the existence of other freight projects of national significance and the outlook for locating, describing, and justifying them are offered.

PROJECT EXAMPLES

The following examples have been selected primarily for their illustrative value. They are not complete or even representative. Each project

is described briefly and the issues the author believes each example illustrates are summarized.

Alameda Corridor

The Alameda Corridor project in Southern California is the best-known example of a project of national significance, although even that designation is not without controversy. The Alameda Corridor project would provide a consolidated rail route and an improved highway route to carry truck and rail traffic to and from the Ports of Long Beach and Los Angeles. It would consist of 32 km (20 mi) of double track, 16 grade separations, a trench section for freeway, and surface street improvements at a total cost of up to \$2.0 billion, depending on the final configuration. The Alameda Corridor project has several distinctive features:

- A focus on foreign trade, making the national interest more apparent;
- Joint effort by two regionally competitive ports, removing the issue of favoritism on the regional level;
- Competition with other West Coast ports, raising the issue of interregional competition;
- Involvement of three competing railroads (UP and SP were then separate), forcing the project promoters to deal with the private competitive balance; and
- Stormy relationships with the cities through which the corridor will pass, suggesting a potential clash between local and regional or national interests.

Chicago Intermodal Connectors

Chicago is the intermodal freight transportation hub for the nation. Some 18 to 20 rail facilities load, unload, and transfer intermodal trailers and containers and require a steady stream of steel-wheeled and rubber-tired interchange movements to create transcontinental and interregional service. These facilities generated an estimated 14,200 truck trips per day in 1996 and are forecast to exceed 28,000 per day by 2020. Several studies have documented a number of surface street

impediments to this truck circulation, including tight turning radii on intersections, low clearances, one-way streets, and so forth.

The Chicago Intermodal Connectors project is actually a series of National Highway System (NHS) connector projects grouped together because of the common involvement of substantial intermodal freight traffic (CATS 1996). The original NHS included connectors to only 148 passenger and freight terminals. On the basis of state proposals backed by public and private organizations, the Federal Highway Administration now has identified connectors for an additional 1,251 terminals nationwide (*Intermodal Insights* 1996a), some of which are incorporated in the Chicago Intermodal Connectors project. [An even broader look would consider the 30 proposed freight connectors to the NHS in northeast Illinois, totaling 83 links and 76 km (47 mi).]

Instructive features of the Chicago Intermodal Connectors initiative include the following:

- “Bundling” a number of small projects into a package with a unifying theme and purpose,
- The emerging legitimization of “connector” and “bottle-neck” projects, and
- Recognition of a national interest in local traffic conditions and of the need for national traffic flows to be good local neighbors.

Mexican Border Crossings

The highway crossings of the Mexico–U.S. border at Laredo and El Paso, Texas, are congested, and the issue is seriously complicated by controversy over Customs procedures and Texas Department of Public Safety truck inspections. Attention has been focused on the situation by the signing of the North American Free Trade Agreement (NAFTA), which is expected to increase truck traffic in the long run. Proposals vary, but the key feature is substantial highway and bridge capacity additions at the two gateways coupled with changes to border processing facilities and procedures.

While controversy rages over the highway side, some railroads have been making improvements on their own. UP completed a \$3.3 million yard expansion at Port Laredo in 1996, capping an investment of more than \$33 million since opening in 1990 (*Intermodal Insights*

1996b, 104). UP has also expanded its “Aztec Eagle” intermodal service through Laredo. The key to this service is inbound customs clearance, a procedural change that allows intermodal shipments to cross the border without stopping.

Instructive features of the Mexican Border Crossings project include the following:

- Like the Chicago projects, a bundling of smaller projects with a common theme;
- Like the Alameda Corridor, a connection with foreign trade and an apparent national interest;
- Faster, parallel private infrastructure initiatives; and
- Major institutional and organizational aspects, many of which are more difficult than the infrastructure issues.

Intelligent Transportation Systems Projects

Intelligent Transportation Systems (ITS) is an attempt to marry information technology and transportation technology with the aim of reducing traffic congestion, improving safety, and expediting freight movements. To the extent that the “intelligence” can avoid the need for massive new highway investments, ITS offers the attraction of “doing more with less.” The ITS nomenclature has replaced the Intelligent Vehicle Highway Systems terminology and in its current manifestation is somewhat more modest in its claims and ambitions. Nonetheless, the claims made for the potential benefits of ITS suggest that ITS research and implementation efforts could be projects of national significance. Moreover, ITS is a leading example of a nontraditional infrastructure project, one that involves more silicon than steel.

The size of ITS could be staggering: one source estimates that the market for ITS would be \$75 billion in the public sector and \$350 billion in the private sector by 2015 (*GO-West* 1997, 30). The claimed potential benefits would be large and widespread. Urban traffic congestion would be reduced and safety improved, benefiting both passengers and freight. Additional benefits to freight transportation users, principally truckers, would include weigh-in-motion technology and weigh station bypass, dispatching assistance, improved operations management information, and paperless regulation and commerce.

The EVP and COO of the Intelligent Transportation Society of America, Hal Kassoﬀ, argues that ITS is “inevitable” but that attaining optimal implementation and use involves a “process of unparalleled complexity because of the number of institutional and technological domains that must work in some semblance of harmony for the whole thing to succeed. . . . It will require commitment and support from the public sector, profit incentives and technological compatibility from the private sector, and a willingness to collaborate in a spirit of enlightened self-interest on the part of all stakeholders” (Battelle Memorial Institute 1997). This rather daunting vision of complexity could be advanced as justification for government involvement.

How much of the total ITS initiative really requires or justifies public-sector funding? Clearly it is a very large endeavor, far beyond the scope of any single private organization, and technology development costs are likely to be unrecoverable from individual implementations. Clearly it is in the public interest to “do more with less,” especially when the subject is costly freeway capacity.

The ITS initiative illustrates

- The tendency to envelop similar initiatives to broaden constituencies,
- The potential importance of nontraditional infrastructure projects, and
- Typical demonstration and pilot projects.

Puget Sound “Big Valley” Corridor

The Puget Sound “Big Valley” corridor would include \$1 billion in rail line and grade crossing improvements over an 80- to 113-km (50- to 70-mi) corridor with UP and BNSF lines serving the ports of Seattle and Tacoma. An estimated 70 percent of port traffic goes via rail to or from inland points via 34 intermodal trains per day in each direction, giving this corridor the same national/international aspect as the Alameda Corridor. The project has active support from the Washington State Department of Transportation, the Puget Sound Regional Council, state legislators, BNSF, and UP. None of these parties, however, has come forth with funding. Project advocates are explicitly seeking “project of national significance” status. The key features of this project are clearly similar to those of the Alameda Corridor:

- International trade issues,
- Packaging a series of smaller improvements into a consolidated “corridor” proposal, and
- Local funding shortfalls in a multijurisdictional issue.

Southwest Passage

The Southwest Passage is a proposal for an integrated trade and transportation corridor extending from the Ports of Los Angeles and Long Beach to Houston (with connections to the East). Sponsored by the Southern California Association of Governments (SCAG), the Southwest Passage concept is intended to tie together the San Pedro Bay ports, the Alameda Corridor, Pacific Rim trade, NAFTA, landbridge movements, and continental U.S. transportation traffic into a focused pattern of investment and development over a rail and highway corridor some 2600 km (1,600 mi) long. In one respect, the Southwest Passage concept addresses the question of what happens at the east end of the Alameda Corridor. SCAG is seeking to build a coalition of metropolitan planning organizations (MPOs), state departments of transportation, federal agencies, and the private sector to coordinate and support transportation infrastructure improvements in the corridor.

The Southwest Passage proposal illustrates

- A conscious effort to package a variety of projects under a common name and organizing principle, and
- A corridor-based project definition that clearly transcends regional and state boundaries.

Seattle Traffic Report

In the Seattle area, commuters or truck dispatchers can obtain continuous traffic condition maps, photographs, video images, and bulletins at an Internet website sponsored and maintained by the Washington State Department of Transportation. The website (www.wsdot.wa.gov) provides a map of Seattle-area freeways color-coded to indicate traffic conditions (e.g., “stop and go,” “heavy,” “moderate”), access to information on traffic incidents, and bulletins regarding lane closures and other items. A linked Video Snapshot site provides video images of freeway conditions from 34 remote cameras updated approximately

every 90 sec. Whereas this could conceivably be categorized as an ITS project, it appears to have been started and implemented independently. It is regarded as a way of improving traffic flow through information technology rather than expanding infrastructure.

A similar but much more modest effort provides video snapshots of California Route 17 (a major feeder to Silicon Valley) between Santa Cruz and San Jose at www.interactt.com. This effort is privately funded, supported in part by advertising banners on the website.

The Seattle Traffic Report and Route 17 examples illustrate

- The potential for information-based transportation projects, and
- An unusual form of public-private partnership (akin to advertising messages on public buses).

Kedzie Stoplight

This project has been called the “ISTEA Poster Child.” Where the entrance and exit to BNSF’s Corwith intermodal terminal meets Kedzie Avenue in Chicago, there is no traffic signal despite a daily traffic volume of roughly 1,800 heavy trucks. The problem has been recognized within the intermodal freight industry for more than a decade and has been the subject of a multiyear discussion among Santa Fe (BNSF’s predecessor), the Chicago Area Transportation Study (CATS, the local MPO), and the Chicago Department of Transportation (CDOT).

The result, announced in late 1996, has been a \$3.5 million project to rebuild and resurface 5 km (3 mi) of Kedzie Avenue between the Corwith entrance and the expressway, and to install the traffic light, in 1997. A major breakthrough was the use of \$720,000 in Congestion Mitigation and Air Quality (CMAQ) funds, freeing up local funds for other uses. The project grew from a simple stoplight installation to a \$3.5 million project because the stoplight was only part of the problem on Kedzie Avenue:

- To be effective, the stoplight had to be part of a traffic control system on Kedzie Avenue, and the existing system could not accommodate a new light.
- Kedzie’s pavement was deteriorating under the truck traffic.

- Reconstruction of the intersection required moving signs and utility poles and building traffic-channeling devices.
- Because of the nature of the traffic, CATS and CDOT analysts had more difficulty justifying the projects than they would a comparable passenger-only project.

The Kedzie Avenue experience suggests the following:

- It may be very difficult to undertake small projects in isolation, however simple or cost-beneficial they may appear, because they become part of a more complex traffic and transportation system.
- It may also be necessary to expand the scope of small projects to attract enough attention and support.
- Identifying, analyzing, and justifying freight projects will be hampered by the lack of data and standard measures for economic effects and other factors.

Private Infrastructure Projects

Examples of projects that are significant in the national transportation network and that are undertaken privately can be found. The best examples probably come from the railroad industry, which owns its infrastructure. Some of these projects are even associated with candidate public projects discussed earlier.

- Union Pacific has promised to spend more than \$200 million to double-track 1370 km (850 mi) of former SP line between Los Angeles and El Paso.
- The Atlanta/Dallas rail corridor paralleling I-20 from Meridian, Mississippi, to Dallas is getting \$200 million in improvements from Kansas City Southern starting in 1993.
- BNSF and J.B. Hunt built a new underpass in Chicago in less than 1 year, with actual construction in less than 1 month. It is next to the 47th Street underpass, which required 5 years for publicly financed clearance improvements.

These projects illustrate the ability of private concerns to undertake massive infrastructure investments and to move much more quickly than the public sector.

DEFINING A “PROJECT”

As noted at the beginning of the paper, a definition of “project” is needed. At the least, a list of the types that the definition is to cover should be provided. Even the limited range of examples presented above should show that the definition of “project” is no longer obvious. In the past, the term was generally understood to mean traditional public works infrastructure—concrete and steel, or closely related technology and research. Most ISTEA projects are traditional public works infrastructure projects. There are several reasons for this outcome:

- The public works infrastructure needs are overwhelming and well documented. Legitimate public works projects already identified and documented could absorb most or all of the available funds.
- Public works projects are tangible, and the public investment is apparent to local and regional officials, taxpayers, and voters.
- Evaluating and prioritizing public works projects is relatively straightforward, since the methodologies have been progressively refined and institutionalized over the last four decades.
- The equity issues raised in public works projects are typically the allocation of funds among states or localities and are addressed through legislatively and administratively negotiated formulas.

Should we continue the traditional emphasis on “public works” infrastructure? It is easy in that it is most like what we have done in the past. But what if the biggest barriers to freight transportation efficiency are elsewhere? Both the advent of electronic technologies and the recognition that organizational, institutional, and regulatory restraints can be as important as infrastructure shortfalls suggest that we should broaden the definition.

Freight transportation projects are almost invariably proposed as responses to perceived problems, so a list of problem types is a good place to start.

Intermodal Freight Problem Types

A Cambridge Systematics report on intermodal impediments described five categories.

1. Infrastructure impediments, the traditional public works projects such as mitigation of highway bottlenecks, intermodal connectors, facilities limitations, or harbor dredging. This category accounts for the vast majority of projects. CATS has solicited proposals for intermodal freight projects. The 47 projects suggested to CATS were almost all traditional public works projects such as grade crossing separations, intersection improvements, and access remediation.

2. Operational impediments, such as lack of electronic data interchange (EDI) capability, lack of coordination among modes, or inflexible operation practices. Operational impediments can be of many kinds. Where technology is lacking, publicly funded research might be the answer. Where coordination or standards are lacking, government standard-setting may be effective. Where operational problems arise because of historical practices or in response to suboptimal incentives, there may be ways for public agencies to shift the incentives or at least neutralize the wrong ones.

3. Regulatory impediments, such as unnecessary or inconsistent government regulations or unnecessary delays in permitting or licenses. Regulatory constraints are clearly a public issue with a public remedy. But efforts to date have found few significant regulatory impediments, and such impediments would rarely require public funds to mitigate.

When CATS solicited proposals for intermodal freight projects, none of the 47 proposals received concerned restrictions, rules, or regulations. The National Commission on Intermodal Transportation discussed the need for the restructuring of federal agencies but did not cite regulatory or legislative impediments. The Gateway Cities Trucking Study (Meyer, Mohaddes Associates 1996) found that some local zoning and traffic engineering practices were impediments to trucking efficiency, but they are likely to remain local issues even if they are common across the country. However, there may be a need to fund analyses and feasibility studies of controversial regulatory changes.

4. Financial impediments, such as funding restrictions, funding shortfalls, or low profitability. Financial impediments are often derivatives of the other categories, the reason why many problems go unaddressed regardless of merit or urgency. Financial impediments do not lend themselves to remediation projects.

5. Institutional impediments, such as the differing public and private viewpoints, relationships among modes, public perceptions, and

the NIMBY (not in my backyard) syndrome. Institutional impediments can be extremely tough to tackle, but widespread agreement on their importance suggests that we should not give up simply because we are more comfortable building new roads.

For example, it has taken several years to simply assign responsibility for correct container weights. The Intermodal Safe Container Act of 1992 was followed by 5 years of U.S. Department of Transportation rulemaking and implementation struggles. The issues were largely institutional: Who would be responsible for what and when? What certification process would be used? A final industry negotiations round culminated in the Intermodal Safe Container Amendments Act of 1996.

Several potential institutional improvements for intermodal freight were compiled by the Volpe National Transportation Systems Center:

- Remove funding barriers to investing in improvement projects involving multimodal and multijurisdictional operations and common-user terminals, and help realize the provisions in ISTEA for funding flexibility for such projects.
- Remove the barriers to more efficient interline operations by improving communications among railroads and initiating “run-through” agreements for interline transfers.
- Work with industry advocates to have uniform weight restrictions and incorporate the requirements of the Intermodal Safe Container Act of 1991 (eventually 1996) in the existing EDI protocol.
- Standardize communications protocols and EDI formats to ensure interoperability of all data transmission mechanisms and compatibility of all software and operating systems.
- Remove the barriers to formation of regional alliances, freight pooling, track sharing, and joint terminal use to help build a more efficient hub-and-spoke system and achieve market density (Volpe National Transportation Systems Center 1996, 6–13).

An institutional project along the lines of the third and fourth items would likely involve industry outreach, workshops, feasibility studies, and demonstration projects for new communications protocols or software standards. Our definition should encompass such projects.

Removal of institutional barriers, on the other hand, would not ordinarily be packaged as a project or require federal funding.

Freight Transportation Project Types

The likely solutions (rather than the problems) are as follows: (*a*) public works infrastructure improvements and impact mitigation (for example, the Alameda Corridor), (*b*) technology and operations research and development (for example, ITS research and demonstration projects), (*c*) information technology and dissemination projects (for example, the Washington State Department of Transportation Seattle Traffic Report), and (*d*) institutional and organizational projects (examples are lacking but would probably include task forces and demonstration projects).

Metaprojects

There are good reasons to consider what might be termed “meta-projects”—initiatives with no immediate effect on freight transportation but that contribute to long-term progress. In the light of serious unmet needs for freight transportation planning tools and data, it may be necessary to create an “analytic infrastructure” before we can do a good job of traditional concrete and steel infrastructure projects. Among the possible metaprojects are

- Data collection and database development in support of project identification and evaluation,
- Model and simulation development for project design and evaluation,
- Standards development and dissemination, and
- Creation of planning tools and guidelines.

Such efforts could significantly reduce the barriers to project identification and implementation cited above. Although they may not provide an immediate, tangible transportation payoff, such efforts would serve long-term national goals by promoting and improving the process of designing and evaluating tangible projects in the future.

DEFINING “NATIONAL”

To define “national” in this context, we can start by examining the new national perspective on freight transportation, the major justifications for federal involvement, and the key elements underlying national freight transportation policies.

Freight Transportation as a National Issue

What makes some of these projects “national”? Surely no one would deny the importance of freight transportation to the nation as a whole. In the 18th and 19th centuries, freight transportation and the emerging rail and marine technologies were of central importance in the development of nations, states, and cities. Ports were the *raison d’être* for coastal cities, and a new prairie town bypassed by the railroad was doomed. City fathers and local businessmen backed a bewildering array of schemes for canals, roads, and railroads—not unlike the broad range of projects offered under ISTEA.

The long-term success of those efforts has helped push freight transportation back from the edge of public consciousness. As freight transportation has become both ubiquitous and efficient, it requires a smaller share of our national resources and less of our limited public attention span.

The factors bringing freight transportation back into the public limelight impinge on our definition of “national significance” and our ability to support such projects. Competition has intensified across almost all industrial segments as the world goes through a wave of deregulation and privatization. Transportation and logistics have come under closer scrutiny as private-sector competitors realize they can leave no potential advantage untapped, and the public sector has embraced the larger idea of global competitiveness as a public goal. Increased awareness of traffic congestion and safety issues has also focused attention on freight transportation as transportation planners attempt to untangle urban traffic.

Historically, the federal government has been willing to step in when interstate commerce is at stake. But it is almost impossible to envision a freight-related project that would not benefit interstate commerce or a bottleneck that does not in some way impede it. The same

highway improvement can benefit passenger automobiles, buses, local delivery vans, interstate trucks, and intermodal drayage vehicles.

It is critical, however, to distinguish local and national costs and benefits. Local employment and economic development are commonly used to help justify transportation projects. Whereas the nation as a whole benefits from net employment gains and economic development wherever it occurs, some development issues inevitably involve transfers between regions or the development of one area over that of another.

National Involvement

The major historical reasons for government involvement—usually federal government involvement—fall into these categories:

- **Public goods:** Public goods are, roughly speaking, goods or services that benefit the public but whose cost cannot be readily recovered through user fees. The example usually cited is national defense, and the existence and importance of public goods is one of the basic justifications for the very existence of national government itself. The current system of roads, streets, and highways is a mixed system, with some cost recovery through user fees and tolls but retaining many aspects of public goods. Tolls are usually collected for specific highway segments or bridges, and most proposals for electronic user fees are likewise directed at major arteries rather than at the vast and indispensable network of local streets and roads. Although fuel taxes and use fees implicitly build the cost of some highways into the overall cost of vehicle operation, the connection between ordering a truckload of materials and paying for the highway through a small portion of the delivery fee is remote at best. The indirect connection between funding and demand often leads observers to treat road and highway projects as public goods, with the discussion focused on the competing needs of various localities. Research and development efforts may also be public goods. Whereas no single user or user group could justify the research expenditure with an expectation of benefits captured, a government can spread the cost and risk of research and development much more broadly. Federal involvement starts when the states cannot capture or embrace enough of the costs and benefits to make an optimal decision for the nation as a whole.

- National or regional scale: Some projects or developments exhibit economies of scale that cannot be realized at the local or state level. Mechanisms for regional coordination are limited, leaving the federal government as the logical leader in such cases. Adoption of uniform highway markings and signage is an example, where consistency across state boundaries conveys an additional benefit. Air traffic control is an example in which coordination across regions is not only beneficial but vital. Some projects are too large, too risky, or have payoffs too distant for ordinary local or regional funding. In the case of the Alameda Corridor, bond financing may have been impractical because of the long and somewhat uncertain payback period. Recognition that local and regional improvements are part of a national transportation system implies that national funding may be justified for projects whose costs and benefits transcend local and regional scope.

- National defense: Because national defense is a national responsibility, transportation improvements necessary for national defense are also national responsibilities. Indeed, the Interstate highway system was begun as a means of ensuring national defense mobility.

Whatever definition is used should reflect these basic reasons for government involvement and allow for their application to freight projects.

The following arguments can be made for the projects discussed earlier:

- The Alameda Corridor, the Chicago Intermodal Connectors, the Mexican Gateways, the Kedzie Stoplight, and the Big Valley Corridor are of national significance because so much of the traffic at stake is international or interstate freight destined to or from other regions. The available mechanisms are insufficient for the localities to recapture the cost through user fees without undue risk or delay.

- The Seattle Traffic Report is primarily a regional project but could serve as a demonstration project for national application.

- The ITS initiative is of national significance because no single state can justify the development costs on the basis of local benefits alone.

- The Southwest Passage is of national significance because its scope transcends the ability of individual states to analyze and justify improvements that would yield net national benefits.

These arguments may not pass strict theoretical scrutiny, since the projects and their outcomes are so complex. But it appears that these arguments are fundamentally acceptable to the public sector, which is providing the funding and seeking “nationally” significant projects.

Federal Versus State Perspectives

Examination of these reasons indicates one common element: a national decision on the project in question would be different from a state decision. The federal perspective might, for example, justify a project as cost-beneficial from a national perspective even though it is not cost-beneficial from the state perspective (i.e., the state may not see the net benefits that would accrue to the nation as a whole); justify a larger project, encompassing more features or territory, to accommodate interstate freight flows as well as local needs; raise (or conceivably lower) the priority of a project when national interests are combined with local or state interests; or see a long-term national need for action where no problem is perceived on the local level.

Another way of saying the same thing is that federal involvement is justified when a locality, region, or state would make a suboptimal decision from the national perspective. If the city, region, or state made the same decisions as the federal government (assuming perfect decision making by all) and approved and rejected the same projects, arrived at the same project priorities, and developed the same project scopes, there would be no need for federal involvement.

National Transportation Policy Elements

In addition to a national interest in freight transportation, there are national goals or policy elements. The official National Transportation Policy has gone through several permutations and will continue to change in detail. Within almost all of its manifestations, however, there are a few enduring policy elements applicable to freight. A definition of projects of national significance should reflect these policy elements.

Comparative Modal Advantages

The notion that each transport mode has inherent advantages and that the customer should be able to exploit those advantages freely has been

embedded in national transportation policy since that policy was first established in 1920. For example, railroads are generally efficient in hauling large quantities of goods over long distances, whereas trucks are uniquely suited for urban pickup and delivery. It is in the public interest for each mode to develop its comparative advantages to the fullest extent and to offer efficient services to the shipping public. Freight projects of national significance should permit each mode to develop such comparative advantages.

Mode and Competitor Neutrality

At the same time, it is widely held that the government should not favor the success of one mode or one competitor over another. Projects should permit the development of modal advantages but not promote or handicap individual modes or firms. The public should not seek to alter the competitive balance, even though it is almost always altered as a by-product.

Modal Access and Connectivity

Access is a pivotal concept in many proposed freight projects. For customers to exploit the comparative advantages of freight transport modes, they must have access to competing carriers with a minimum of restrictions. Restricted access is regarded as a constraint on the customer's ability to choose and use the best mode or combination of modes for the purpose. The freedom to combine modes with a minimum of restrictions gives rise to the issue of connectivity: not only should the customer be able to access multiple modes, but also the modes should be able to interchange goods and shipments efficiently. This goal gives rise to types of projects (terminal connections, institutional initiatives, etc.) different from what would be encountered if each mode were treated in isolation.

Efficiency and Global Competitiveness

Efficiency, the use of the fewest possible resources to conduct freight transportation activity, is almost certainly a social good. Barring circumstances where efficiency might yield exploitable market power, the

public will benefit where efficiency gains are passed on and will be no worse off even if the gains are kept. Projects could promote efficiency in many ways: improved operations, improved technology, better information, and so forth.

Global competitiveness is an elusive concept. Global competitiveness is the sum of national capabilities and efficiency, and freight transportation efficiency can give exporters additional leverage in world markets. In the United States, for example, efficient rail service brings export coal to port at the lowest possible cost, helping the coal producer compete with other global coal sources. It must be recognized, however, that any overall transportation improvement that reduces the inland movement cost of exports probably also reduces the inland delivery cost of imports and enhances their ability to compete with domestic products. Global competitiveness is a project justification to be used cautiously.

Competition and Choice

Competition and efficiency are closely linked, since the public relies on competition as a spur to private efficiency and as insurance that the benefits of efficiency will be passed on to the public. Freight projects should therefore promote or preserve competition, yet the private sector is of two very different minds about promoting more competition:

- More competition is always desirable for a company having only a small market share and expecting to gain.
- More competition appears to be an unwarranted public intrusion in private enterprise for a company having a large market share and expecting to lose.

In particular, public projects that may give new competitors access to existing markets are highly controversial. Anything that could disturb the current competitive balance is anathema to those who benefit from the status quo. A more modest goal is preserving customer choice among current competitors and not foreclosing customer options.

Coexistence

The most recent proposed federal freight transportation policy included the following principle: "Promote effective and equitable joint

utilization of transportation infrastructure for freight and passenger service” (*Federal Register* 1996, 14,588).

The issue, however, is broader than just sharing the transportation infrastructure. In every way, freight and passenger flows must coexist with the communities through which they pass and exert a minimum of adverse effect on them. The nation as a whole appears forever suspended between the need to move freight and the desire to shift freight transportation activity somewhere else. The Chicago Intermodal Connectors and the Alameda Corridor both contain elements designed to mitigate the local effects of national freight flows. With heightened local awareness of transportation effects and activism by local interests, it can be anticipated that every major freight transportation project will have to devote significant resources to reducing local adverse effects, whether that requires noise barriers, grade separations, wider intersections, or environmental mitigation.

DEFINING “PROJECTS OF NATIONAL SIGNIFICANCE”

How broad should the definition be? how flexible? Two guiding principles are as follows:

- The definition should be broad enough to embrace the most cost-effective public investments. The public’s money should be spent in the best way, whether or not it fits a traditional mold. In particular, the definition should cover the full range of projects and metaprojects described above.
- The definition should be flexible enough to accommodate the future. Despite forecasting efforts, what the future will look like is not known, especially within the long lives of many public projects. A look back over the last 20 years discloses major changes, such as widespread computerization and the introduction of double-stack trains, that could not have been predicted.

The preceding discussion implies the need for twin criteria for projects of national significance. Projects of national significance should (a) return net public benefits that transcend regional or state bound-

aries and (b) be projects that would not be or cannot be implemented by private, local, regional, or state means alone.

In other words, a project of national significance is one whose potential net national benefits would not be realized without federal involvement. The point of defining and locating projects of national significance is to direct public funds and other forms of public support to their best uses. Michael Huerta of the Office of Intermodalism has suggested that “national significance” may be synonymous with “worthy of federal support.” “Worthy” implies a criterion of merit, which we have provided in requiring net public benefits. But federal support is a scarce resource, to be used only when necessary, so we must also apply the second criterion to determine whether the net public benefits can be realized without federal involvement.

It may be very difficult to say precisely what can or cannot be implemented by private, local, regional, or state means alone. Left without a hope of federal assistance, localities and states might develop new ways to capture user benefits and fund projects locally. Moreover, projects may be defined and scoped to attract federal involvement and might emerge in a reduced form if federal involvement were precluded from the beginning. The Seattle Traffic Report might be construed as a strictly local project and the methods or technology sold to other regions to recover the development cost. Local or state revenue bonds might be used to finance a more modest version of the Alameda Corridor. Would the extra-regional benefits be lost? Would the development decision change, suboptimally, without a federal role? In each case, some judgment is required concerning the practicality of local development without federal support.

By this definition we are implicitly arguing that all projects of national significance deserve federal funding. At the outset we noted that the main reason for developing a definition was to identify such projects and assist with the allocation of resources, so this implicit argument is appropriate. If the federal government wishes to recognize projects that contribute net national benefits but that it need not fund (such as the large private railroad projects mentioned earlier), some other term can be invented (e.g., “national contribution projects”). Cynics, however, would argue that any such recognition encourages funding applications. Conversely, if we wish to use the term “project of national significance” to describe beneficial projects that do not need

federal involvement, we would have to invent a new term for those that do require support.

The national policy elements discussed earlier yield additional criteria for projects of national significance. A broad definition of projects consistent with national policy elements would include proposals that

- Improve access,
- Improve connectivity,
- Increase efficiency,
- Promote coexistence or mitigate adverse impacts, or
- Improve public planning and decision making for freight transportation

and that allow the development of comparative modal advantages with modal and competitive neutrality.

Note that this definition does not include a measure of significance. Significance, outside the realm of statistical analysis, is a relative term. Any project that returns net public benefits from a public investment has significance, and those returning the greatest net public benefits have the most significance. The size of the project and the project's benefits should be critical in ranking or prioritizing the candidates, not a threshold for candidacy.

FINDING AND MEASURING NATIONAL SIGNIFICANCE

The task of finding and measuring national significance is daunting. There are numerous barriers to be overcome and needs to be met.

Barriers

MPO Staff and Resource Shortages

The final recommendation of the National Commission on Intermodal Transportation was to “strengthen the MPO process to accomplish the goals of ISTEA.” There are more than 340 MPOs, and very few have even a single individual with full-time responsibility for freight or goods movement studies:

In virtually all States and MPOs, freight emphasis is hampered by the shortage of personnel available to deal with freight issues. It is not unusual for an organization to have only one or two professionals, out of staffs of 50-120, devoted either full or part time to freight issues, and in many organizations, freight has been only a collateral duty for a single individual. (H. Caldwell, 1997, personal communication)

Even the largest and most active, such as SCAG and CATS, are hard pressed to devote staff attention to freight issues for the months and years necessary to gain thorough understanding of the field and develop local projects from inception through implementation. Indeed, CATS found that since its publication of the Operation GreenLight goods movement report in 1991, freight interests had been “losing ground” because of the departure of a single key CATS staff member (CATS 1997a, 2).

Freight issues are complex, and as long as MPO staffing and resources for freight issues are scarce the nation runs a grave risk of making fundamental errors in freight transportation policy and projects through lack of familiarity with the industry. Railroads and trucking firms have sometimes had the unnerving experience of being unable to recognize their own operations and traffic volumes in public agency reports and consultant studies.

Lack of an “Analytic Infrastructure”

Compared with the wealth of data, analytic methods, standards, and simulation models available for passenger transportation planning, there is a gaping void for freight. A review of the Transportation Research Board’s 1997 *Publications Catalog* located only one publication addressing freight data issues and one publication giving analytic methods for evaluating freight proposals out of the hundreds of publications supporting highway and transit planning for passengers. Staff analysts and consultants who have attempted to create consolidated databases for goods movements have invariably come up against incomplete and incompatible data sources and been forced to patch together the best available compromise:

Clearly, there is a latent demand for reliable data and defensible analysis that create a solid portrait of the intermodal industry. (CATS 1997b, 2)

The existing national rail, water and highway network databases are lacking in some important elements. (Oak Ridge National Laboratory 1996)

... 90 percent of the nation's largest MPOs responding to the survey reported that they lacked sufficient data to conduct adequate freight planning (GAO 1996, 5)

An MPO analyst attempting to locate cost-beneficial freight projects or evaluate the proposals submitted cannot generally determine in any definitive way

- The identity or demographics of freight shippers or receivers in the region;
- The commodities, quantities, origins, or destinations of the goods moving to, from, or through the region;
- The number, identity, or demographics of freight transportation firms in the region;
- The economic value of freight transportation activity;
- Current freight movement patterns or likely changes, or
- The unit value of time or distance saved because of freight transportation improvements.

Moreover, there are few publicly available models or simulations of freight movement demand or activity for use in transportation planning, unlike the numerous travel demand models published and available to MPOs.

The problem is partly circular: without the analytic infrastructure, planners can be at a loss to identify the issues that might justify data collection. For example, in attempting to determine the economic importance of the intermodal freight industry to the northern Illinois region, the local MPO (CATS) had to qualify the results because of the numerous “back of the envelope” calculations used to fill in missing information. In the absence of a thorough understanding of freight flows and issues, the public sector may make data requests that are regarded as “fishing expeditions” by private-sector respondents.

Funding Limitations and Categories

In reviewing proposed freight projects, CATS staff reviewed some 20 federal, state, regional, and local funding programs in vain for categories covering freight projects. The CMAQ program, for example, has categories for bikeways and pedways, commuter parking, and so forth, but none for freight or goods movement projects (CATS 1997a).

Freight transportation activity is dominated by the private sector, where it is difficult to identify a “national” interest. The very nature of private enterprise makes for an uneasy relationship with the private sector. Whereas public servants are working for the common good, private enterprises compete with one another and begrudge advantages gained by others. Whereas public agencies encourage increased employment and an expanded tax base, private firms attempt to reduce employment and minimize tax liabilities. Private firms are unlikely to willingly serve the “national interest,” even in the long term, if it is inconsistent with their own immediate interests. Freight transportation infrastructure itself is a public-private mix, with the public right-of-way connecting the private terminals and other facilities. Using public money to improve access to private freight facilities is unsettling, even though we do it every time we improve an intersection for a new shopping center or widen a street past a major employer.

Freight activity and issues are unevenly distributed and resist attempts at simple allocation methods. The location of freight facilities and freight activity is dictated by market geography and operational needs without much respect for political boundaries. Although freight activity is strongly correlated with population, freight flows and the freight network follow a logic slightly different from that of passenger flows. The distribution of freight project needs and the demand for freight project funds are therefore unlikely to resemble the distribution of population or votes. Nor is there a measure of freight activity that lends itself to a simple allocation scheme. The massive intermodal container flows that justify the Alameda Corridor cross the California border into the Nevada and Arizona deserts. The New York City population is supported by freight infrastructure and activity across the river in New Jersey.

Needs

Need To Establish the Limits of Mode Neutrality

Government projects are not supposed to favor one mode over another or alter the competitive balance in a region or the nation. We are profoundly uneasy about projects that benefit one commercial entity over another or that convey substantial and visible benefits to private enterprises. This attitude hamstrings us in two important ways. We can become paralyzed, because it is difficult to benefit all private firms equally or even all modes equally. The competitive balance is precarious and sensitive. We cannot act without affecting it, and the losers will cry loudly. We risk losing projects that would convey substantial net public benefits, however invisible they may be, if they also convey substantial and visible private benefits to "freight interests." This would be perilously close to foregoing progress to preserve fairness.

What is often lost sight of is that we are all "freight interests." For the same reason that freight transportation is vital to the nation, it is also vital to everyone in it. Moreover, shippers and consignees usually support potential improvements or benefits to any mode, since they expect to reap the ultimate advantage. It may be wise to listen more closely when the market speaks.

Need To Dramatically Increase Freight Representation in Transportation Planning

The archetypal experience of freight operators under ISTEA was initial elation that freight should be made eligible for funds, followed by frustration as government agencies proved to be un conversant with freight issues, hard to convince, and slow to react. Public agencies need the participation of freight carriers, shippers, consignees, and others with direct knowledge of freight operations, economics, and issues. But so far, government has offered little incentive for cooperation. In the freight transportation community, governmental presence is generally regarded as something to be avoided.

The National Freight Partnership (NFP) is a move in the right direction, but a small one. Moreover, the major point of the NFP is to provide a channel for coordination. Unfortunately, the governmental

focus on process rather than content often leads us to mistake channels for communication and to listen only to the official channel.

Need for Guidelines and Models To Evaluate Freight Projects

We have become very good at measuring the significance of passenger transportation projects, particularly traditional highway projects. But freight projects do not fit traditional passenger transportation molds. ISTEA notwithstanding—or perhaps as a prime example—we as a society have little experience in measuring the public significance of freight projects. “MPOs are required to consider 15 planning factors when prioritizing projects to include in state transportation plans, only two of which relate to intermodal freight transportation” (GAO 1996, 3). Transit operators and state departments of transportation know the rules of the game, what outcomes are reckoned as public benefits, how to measure them, and how to construct a compelling case for funding. We need to establish comparable rules for freight projects and give both government agencies and private project advocates useful guidelines for their interaction.

The public paralysis when confronted with freight projects does not, however, extend to the private sector. One of the reasons for including the private rail infrastructure projects among the examples listed earlier was to illustrate the ability of the private sector to develop, evaluate, fund, and implement comparable infrastructure projects. Major transportation firms have been evaluating capital projects for a long time, over a century in the case of the railroads, and have developed tools and conventions to facilitate the process. Some of these techniques might be usefully transplanted to the public sector.

As noted earlier, Transportation Research Board publications, when taken as representative of the information available to MPOs and others, offer little support in the way of models or simulations for freight projects. However, the private sector has such models and uses them regularly. The author has experience with engineered rail cost models, drayage cost models, terminal capacity and cost models, trucking dispatch software, network operations models, and numerous other models and simulations from spreadsheets using industry standard formulas to computer animation of marine container terminals. Many, if

not most, of these models have been developed by consulting firms or academics and are theoretically available for use and adaptation by public planning agencies. At a minimum, we need to determine what planning and analysis tools are actually available for application to freight problems.

Need To Establish the Extent of Competition and Rely on It To Turn Private Benefits into Public Benefits

Public transportation policy encourages competition, and one of the primary reasons to do so is to maximize the efficiencies that are passed on to the public rather than converted to excess profit. To the extent that we have been successful in encouraging competition (or preserving it where it exists), any project benefits that accrue to transportation companies will be passed on to transportation customers and eventually to the public in general. A trucking company that experiences lower costs through improved access or reduced congestion should offer the public lower rates or better service as a result.

The freight transportation industry appears, from a distance, to be very competitive. There are numerous firms competing within each mode and region, broad substitutability among modes, and the low margins we would expect in a highly competitive industry. There are also numerous regulatory safeguards—although their worth is constantly questioned. Nonetheless, we remain skittish about conferring benefits on freight transportation companies.

THE PROJECT POTENTIAL

How many potential projects of national significance are there? The answer ranges from hundreds to a few, depending on how the projects are defined and packaged.

A key factor in our ability to recognize and justify a series of projects of national significance may be packaging. Almost all of the examples given are actually packages of projects or complex projects incorporating features with multiple purposes. Giving the package a name such as Alameda Corridor, Southwest Passage, or Chicago Intermodal

Connectors serves several critical functions:

- Communicating the underlying theme or purpose,
- Creating a consolidated project whose combined net benefits are more likely to justify national involvement,
- Catering to multiple stakeholders and consolidating their support behind a single package rather than placing them in competition for individual projects,
- Providing a memorable and attention-getting name for what would otherwise be a mind-numbing recitation of individual projects, and
- Creating a large enough entity that local officials and stakeholders will want to have their names associated with a successful outcome.

One way of guessing how many nationally significant projects there may be is to consider how many nationally prominent organizing principles might be used to assemble project packages.

Major Freight Hubs

Major freight hubs can be the organizing principle, as they are with the Chicago Intermodal Connectors. Other rail hubs include the traditional interchange points between eastern and western rail systems, each of which could define a freight hub and a nationally significant improvement package: Chicago, Kansas City, New Orleans, St. Louis, Atlanta, Birmingham, and Memphis.

Major ports are also major hubs and are often surrounded by rail, trucking, and distribution activity that expands the hub in both space and functionality. These could include New York/New Jersey, Baltimore, Norfolk, Savannah, Charleston, Miami, Boston, New Orleans, Los Angeles/Long Beach, Oakland/San Francisco, Portland, and Seattle/Tacoma.

Major cargo airports would similarly define hubs, as would major border crossings (as in the Mexican Border Crossing example).

Major Freight Highway Corridors

The Southwest Passage includes both highway and rail elements, the highway element being centered on I-10. Each of the other major

cross-country Interstates could serve as a centerpiece for a freight project package, for example, I-5 (Seattle–San Diego), I-80 (San Francisco–Chicago), I-40 (Los Angeles–St. Louis), I-90 (Seattle–Chicago), I-95 (Boston–Miami), I-10 (Houston–Jacksonville), I-55/57 (Chicago–New Orleans), and I-80/90 (New York–Chicago).

Major Freight Flows

If national transportation policy is dedicated to increasing global competitiveness, we might use that as an organizing principle. Any projects of national significance associated with global competitiveness are likely to be found in specific export commodity flows where U.S. inland transportation is a significant part of total delivered cost. Containerized cargo generally has a high value relative to its transportation cost, the classic example being electronics or other high-tech commodities. Table 1 gives the 20 largest U.S. noncontainerized export commodities in terms of 1995 tonnage. Significant effects on global competitiveness of U.S. exports should be found in flows of these commodities, if anywhere.

It would be possible to map the export flows of these commodities and use their routes as organizing vehicles for project packages. The 20 commodities in Table 1 could give rise to 20 packages of improvements dedicated to facilitating the flow of nationally prominent exports.

APPROACHES

The objection could be raised that a broad and flexible definition leaves the implementing agency with a lot of work to do in sorting out the myriad proposals that could become candidates. It could also be argued that such a broad definition gives little guidance on where to look for candidates. Given that very broad and flexible definition, how do we go about finding, analyzing, justifying, and implementing such projects? We can describe two general approaches and recommend one over the other.

Top-Down National Approach

A top-down approach entails adopting a national perspective and looking for projects that would qualify as nationally significant, much like the

TABLE 1 Largest U.S. Noncontainerized Export Commodities, 1995 Tonnage (Standard and Poor's DRI)

COMMODITY	TONNAGE (METRIC TONS)	PERCENT OF TOTAL
Total bulk exports	352 666	100
Grain	110 950	31
Coal and coke	82 422	23
Petroleum products	46 670	13
Oilseeds	20 968	6
Lumber and wood	19 354	5
Other chemicals	12 016	3
Cement, lime, and stone	11 393	3
Other ores and scrap	7 677	2
Pulp and waste paper	5 678	2
Liquid bulk chemicals	5 174	1
Iron ore	5 168	1
Oils and fats	3 510	1
Iron and steel	3 235	1
Paper	2 592	1
Bauxite and other base metal ores	2 513	1
Natural and manufactured gas	2 052	1
Plastics and chemical products	1 865	1
Meat, fish, and dairy products	1 737	0
Food products	1 713	0
Heavy transportation equipment	1 572	0
All other	4 407	1

starting point for this paper. A search for candidates would take one or both of two forms: (a) a data-driven analytic effort by federal employees or contractors to locate freight transportation bottlenecks, improvement opportunities, promising technologies, potential information applications, and other potential projects; or (b) a series of workshops, hearings, or other solicitations for nationally significant proposals generated by private or public interests.

Either search method would be followed by analysis and prioritization. Each proposal would be reviewed for the potential net national public benefits and the need or justification for federal involvement. There are serious problems, however, with the top-down approach.

The success of a data-driven search approach depends on the availability of the required data and analytic tools. Experience in the field discussed above is that neither the data nor the methods are available. Moreover, neither federal agency personnel nor contractors will have intimate knowledge of local and regional freight transportation issues across the country, leading to a likely shortfall in the identification process and questionable analytic accuracy.

The success of a national proposal process depends on the ability of and incentives for public and private interests to identify candidates and present a compelling case for consideration. Experience has shown that this cannot be relied on. The work involved in preparing and presenting a proposal on a national level is more than many private parties would undertake, and they lack the expertise to match proposals with appropriate agencies and funding sources.

The top-down approach is also likely to miss projects where national considerations would increase the priority or scope of local or regional projects.

Bottom-Up Local and Regional Approach

A bottom-up approach would encourage localities and private parties to submit a wide variety of projects for local consideration. Projects with only local net benefits would be funded locally, if at all. Proposals with regional effects would be forwarded to regional agencies. Proposals with national implications would be forwarded from the regional to the national level. Federal agencies would then be reviewing only proposals that regional and local agencies had reviewed and that they believe to be projects of national significance. This approach has several advantages:

- A wider variety of proposals is submitted.
- Local and regional analysts review and filter the proposals.
- Local and regional planning staffs use their expert knowledge to match proposals with potential funding sources.

One possible model for this approach is the set of the rules used by CATS to process intermodal improvement project proposals (CATS 1997c, 10):

1. If the project as proposed involves only improvements to private property and no clear public benefits can be identified, then the project is disqualified, at least until some public benefits can be identified.
2. If there is reason to believe that a private-sector solution is possible, then it must be evident that the private initiative has been tried first and found wanting before any public investment can be proposed.
3. If the proposal involves the participation of parties in addition to the proponent, then the proponent is asked to produce evidence that other parties are willing and cooperative partners. Absent such evidence, the project is not advanced.
4. If the proposal is not essentially a transportation matter but more a matter of, for example, public safety and security, a referral was attempted to a more appropriate agency.
5. If the project involves an improvement (remediation) that cannot be supported within the legal or engineering limits of current practice (e.g., a proposal to raise a clearance above present height when the present height is greater than the required minimum), then the project is disqualified on the basis of there being no defining reason.
6. A proposal would be considered "disposed" only when the proponent was satisfied (i.e., staff would not declare a proposal disposed without the consent of the proponent).

A review of 47 project proposals processed under these rules indicates that some were withdrawn by sponsors, some were forwarded to other agencies, some were submitted for incorporation in regional plans, some were made the subject of special studies, and some were not yet resolved as of December 1996. A key feature of these rules is the last item, which ensures that proponents do not perceive the agency as a "black hole" into which proposals disappear indefinitely.

The bottom-up approach appears particularly suited to identifying projects in which national considerations would justify a higher priority for a project than local or regional considerations alone, or in which national considerations would dictate a broader project scope. Local and regional agencies seeking to promote the interests of their jurisdictions would have an incentive to look for such ways to attract federal funds.

CONCLUSIONS

It appears to be possible to craft a working definition of “projects of national significance” consistent with the overall national interest and national policy toward transportation. A broad and flexible definition of “project” should enable us to determine the best ways of investing the taxpayer’s money. An emphasis on projects whose benefits would not otherwise be realized aids us in focusing federal support where it is needed.

The number of potential projects appears to be limited only by our ability to locate and package them in a way that facilitates evaluation and brings out the national significance. The biggest problems we face are the institutional barriers and shortcomings of the process and of the analytic infrastructure.

If the agencies and staffs responsible choose to act as advocates for their regional freight interests and proactively seek projects and elevate them to national attention, the outlook for progress on nationally significant freight issues will be good.

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Information Technology for Freight Transportation Coordination

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The business of freight transportation is undergoing a technological revolution as it moves toward the 21st century. New technologies are being developed and adopted in each mode of freight transportation, such as AC power for locomotives. The one technology that affects all modes is information technology. Information technology related to the coordination of logistics and supply chain management can affect all the modes in a similar way. This technology in the form of electronic data interchange (EDI) has begun to automate and reduce the costs of paper flow required to move goods from shippers, through carriers and transfer points, to consignees. This first step in automation has also enabled the implementation of more sophisticated production systems designed to substitute information about demand requirements for inventory, saving the costs of maintaining slack that used to be needed to respond to changes in demand. The current state of the art is for actors in the freight transportation sector to use information technology to manage shippers' and consignees' inventory. This allows them to leverage information about these requirements together with higher visibility of their

own operations to increase the utilization of large assets such as terminals and rolling stock. Integrating these applications of information technology together with freight transport operations can support the type of coordination required to make pickup and delivery reliable, and the process of transport invisible to the shipper and consignee. To make this type of coordination a reality, an understanding must emerge from individual shippers, carriers, terminal operators, ports, third parties, and government agencies about what information is required, when it is required, and how it will be communicated.

INTRODUCTION

Modal freight transportation is the transport of freight from a point of origin to a destination using a single mode, for example rail. Intermodal freight transportation is freight transportation involving the use of two or more modes of transport, for example motor carrier (truck) and ship. The source of additional complexity in intermodal transport as compared with modal transport is the occurrence of a transfer between modes at least once after the shipment leaves its origin and before it arrives at its destination.

In modal transport, information must be exchanged between the shipper and carrier before the shipment departs from its origin. In intermodal transport, an information transfer between carriers and possibly a terminal or port must occur before the physical transfer can be done. That is, the receiving carrier, and possibly the operator of the transfer point, must be able to view information about the shipment before it is able to move the shipment onward. The ability to share information between these parties and to view information about the shipment while the shipment is in transit is critical to improving the coordination of freight transportation.

Visibility of information is also the key to effective customer service, whether modal or intermodal. The combination of new technologies, global competition, and improved management techniques has caused product introductions to be more frequent and life cycles to be shorter, creating the need for even more flexible supply chains. Global sourcing and marketing require special expertise in handling and security, time-definite delivery, efficient customs clearance, coor-

dination of activities at domestic and foreign destinations, and so on. Visibility of goods in transit throughout the supply chain is expected not only to reduce working capital and inventory levels but also to be more responsive to customers. Today's focus on timeliness and the increased number of business transactions, such as the selling of goods in transit, require that shippers be able to determine exactly where their goods are and when they will arrive. Availability of information about the shipment is exactly what makes it visible.

The objective of this paper is to determine what types of communications and information technology (IT) applications are needed to enhance the service and reliability of freight transportation. The focus is on how IT applications can be used by different actors involved in freight transportation to fulfill their coordination roles. This is particularly important in intermodal transport, where different modes, and possibly carriers, must coordinate their activities. The basic principle followed is that, in addition to supporting the operational aspects, each actor has expertise in one or more essential roles, and IT can be used to provide incentives for the performance of those roles. Thus, IT is not only valuable for support but also for coordination.

The analysis proceeds as follows. Examples of successful use of IT in freight transportation are presented first. Next, estimates of the potential savings that straightforward applications of IT to transportation can have on freight transportation expenditures are discussed, and the microeconomic basis for these benefits is explained. How future gains from IT are likely to come from the coordination of transportation and the supply chain is examined, and the information components needed for this coordination are described. The type of organization and network arrangements needed to support transport for the supply chain is studied, and the state of the most extensive IT initiative, EDI, is discussed. Finally, ways in which government policy can be modified to increase efficiency in the transportation sector are suggested.

SUPPLY CHAIN EXAMPLES REQUIRING IT-AIDED TRANSPORTATION SUPPORT

Two industry examples are given to introduce and illustrate the use of IT-aided transportation support of distribution and production.

The supply chain refers to the set of actors, and their activities, involved in moving goods from their origin to a retail outlet.

Procter & Gamble and Continuous Replenishment

In the 1980s Procter & Gamble (P&G) determined that it needed to move products to market faster and to cut the cost of moving goods from the original source to the consumer. This required redesign of how it goes to market in two dimensions: efficiency improvements and pricing policy. Forward buying, under which distributors and retailers buy several months' worth of goods when they are on promotion (price deals), created spikes in P&G's demand. As a result, P&G was forced to hold extra inventory and then ship large quantities on short notice. Uncertainty about total demand and large changes in periodic demand increased manufacturing, inventory, and transportation costs.

The effort focused on continuous replenishment, where the retailer (the first of which was Wal-Mart) used EDI to transmit daily data to P&G on distribution center (DC) shipments to the retail outlets. EDI is the electronic exchange of documents between organizations for the purposes of commerce or trade and has been promoted as having great potential to advance and facilitate commerce. P&G then computed the order quantities, arranged transportation, and shipped the stock to the DC. The retailer benefited from lower inventory, improved customer service, and labor savings. P&G also instituted "value pricing" to remove the incentive for forward buying on the part of its customers, thereby stabilizing order patterns.¹ Further improvements have occurred by transmitting point-of-sale (POS) data from the retail outlet directly to P&G. P&G computes and generates the order for the shipments necessary to replenish the DC via computer-assisted ordering, forwarding the order information to the retailer. The retailer is left to take care of individual store replenishment, a process that has traditionally been efficient.

Chrysler and Just-in-Time Inventory Management

In the late 1980s Chrysler Corporation needed to streamline production and reduce inventory levels to compete. Since its first implemen-

¹ Value pricing is similar to an "everyday low price."

tation in 1989, Chrysler has used just-in-time (JIT) inventory management to achieve these goals. To implement JIT, Chrysler both used EDI with its suppliers and redesigned vehicle components to reduce manufacturing complexity. JIT production also required changes in the way Chrysler did business—internally and externally. Internally, Sales and Marketing had to forecast demand to provide information for precise production schedules. Externally, Chrysler had to offer longer-term contracts and special cost incentives to suppliers.

Not all suppliers were candidates for JIT deliveries—just those delivering at least one full truckload per day to any Chrysler plant. IT support for JIT was straightforward: after receiving production targets from the demand information, material requirements were calculated. Part orders were computed and transmitted to suppliers daily. The benefits of JIT included massive reductions in inventory (up to 75 percent), improved relations with suppliers, and more efficient use of production assets. The success of JIT depends on the balance between the stability of Chrysler's production schedule and the manufacturing flexibility of its suppliers. Thus, the system had to move together to maintain this balance.

In both of these examples, there were concurrent developments of new business processes and information systems—changes in the way business had been done were needed to take advantage of IT. Moreover, in both cases transportation could be used to make the balancing between production and demand dynamic through quick response and use of the transportation pipeline as inventory. These examples indicate that to participate in a seamless supply chain, actors in freight transportation must be able to receive electronic information about demand (e.g., the order), organize the transport capacity to achieve the pickup and delivery guidelines, transmit this information to the other parties in the supply chain, and provide updates in transit (visibility) and confirmation on delivery. Without these IT-based coordination developments on the transportation side, neither of these supply chain examples can achieve their predicted efficiency gains.

Conclusions from Examples

The examples illustrate that major changes have occurred in logistics practices, and in individual cases the changes have resulted in large pay-offs. Key to the advances has been the application of IT together with

a willingness to redesign the logistics process to take advantage of IT. The cases also highlight that transportation is only one element of the logistics system and that this system must be treated as a whole to understand where the efficiencies are coming from.

IMPORTANCE OF FREIGHT TRANSPORTATION AND THE COORDINATION POTENTIAL OF INFORMATION TECHNOLOGY

With trade barriers between countries falling and the emergence of free trade agreements such as the North America Free Trade Agreement and reduced-barrier trading zones such as the European Economic Community, global trade and competition are increasing. These pressures are driving the modern enterprise to be more efficient than ever before. The key to a country's economic future is a national freight transportation system that is timely and reliable and that is integrated with the country's production of goods.

There are many estimates of the costs of freight transportation. One source estimated distribution costs as 16 percent of the net value of goods. Transportation itself is 40 to 60 percent of a shipper's distribution cost (Andel 1996). This is consistent with the measurement of freight transportation expenditures as 6 percent of gross national product (GNP) in the United States in 1992 (FHWA 1995). The United Nations has estimated the costs of data flows associated with international trade to be between 4 and 7 percent of the value of the goods (UNCID 1990), which is roughly consistent with estimates of administrative costs as 10 to 15 percent of the price of products (Brousseau 1994).

Perhaps more astonishing is that, accounting for subcomponents, the average product going through the supply chain is handled 39 times and crosses an ocean 4 times (Richardson 1996)—meaning that the percentages given above are incurred repeatedly as the production process converts raw materials to finished goods. These percentages suggest that between one-fourth and one-half of freight transportation costs are information flows—meaning that information flows in the transportation industry can consume up to 3 percent of GNP.

That the freight transportation percentage of GNP is not higher is a testament to the efficiency of the nation's freight transportation sys-

tem. Nonetheless, significant advances are still possible through the use of IT. For example, it has been estimated that automation and dematerialization of interfirm information exchange could reduce the administrative costs by half (Brousseau 1994)—between one-eighth and one-fourth of transportation industry expenditures. With freight transportation expenditures accounting for \$367 billion in 1992, this implies a reduction of between \$45 billion and \$90 billion.

As a proportion of total freight in the transportation system, intermodal freight is becoming increasingly important. In the early 1990s some types of intermodal traffic grew at rates in the 10 to 20 percent range, and the Association of American Railroads forecasts that the number of containers, trailers, and RoadRailers handled by railroads will increase by 20 to 40 percent from 1995 to 2000 (FHWA 1995). Several of these shifts are a result of institutional changes. For example, some of the recent increase in intermodal traffic is due to the Teamsters settlement in 1994 under which unionized trucking firms can shift 28 percent (rather than 10 percent) of their freight onto rail. This change alone opened up \$2 billion worth of new business for the railroads (Bowman 1995). Nonetheless, further efficiency gains are available here as well. Container space utilization is only 61 percent by volume and 68 percent by weight. Similarly, trailer utilization is 52 percent by volume for 12.2-m (40-ft) trailers and 68 percent for 13.7-m (45-ft) trailers (Muller 1995). IT can track the excess capacity and reallocate loads—or find additional shipments, which can be used to increase the utilization and revenue stream from these assets. An interesting example of IT used to generate additional demand is the National Transportation Exchange, a central electronic marketplace for time-sensitive less-than-truckload and truckload shipments. This electronic marketplace provides an interactive and real-time load-matching service for shippers and carriers, whereby shippers put their requests into the market and prequalified carriers look for shipments that allow them to use their excess capacity (Andel 1996).

ECONOMICS OF TRANSPORTATION IT IN THE SUPPLY CHAIN

IT is both a complement to and a substitute for other transportation inputs. In general, IT is a complement to the larger assets in the trans-

portation system, such as the infrastructure (ports, terminals, rail yards) and movement capacity (ships, rolling stock, trucks, containers), because it increases their utilization, leveraging the assets to make the transportation system more efficient. A good example is Maher Terminals, Inc., which uses information systems that track the location of individual containers in their terminal, plan the routing of the containers, and electronically notify drivers of the container location for pickup (Saccomano 1996). Similarly, in general IT is a substitute for other variable expenses such as labor and fuel—expenses that are reduced in efficient operations such as those in the container terminal example above. IT in the form of EDI also substitutes for the costs of paperwork, dramatically reducing variable costs per transaction.

In addition, interfirm coordination efficiency gained from better information is a substitute for inventory. This coordination depends in large part on transportation timeliness and reliability in ensuring that goods are picked up from shippers shortly after they are produced and are delivered to consignees in time to be used in the next stage of production. Examples using on-time reliable delivery as a substitute for consignee inventory include the continuous replenishment system used by P&G and the JIT system used by Chrysler. Coordination that reduces both shipper and consignee inventory results from IT that integrates the carrier as the essential connection in the supply chain, using the transportation pipeline itself as the primary inventory.

Improvements in intermodal transportation that provide more reliable and timely door-to-door pickup and delivery have caused some firms to spend *more* on transportation. This is because the ability to depend on the transportation system, even at an increased cost, is more economical than stockpiling inventory. Thus, firms require less slack in the form of inventory if the movements of goods can be synchronized with production. Uncertainty, such as unexpected fluctuations in demand, in the value chain (that is, the activities that convert raw materials to finished goods) is visible in the inventories between activities. This uncertainty increases for activities further back in the value chain, creating a bullwhip effect whereby small uncertainties at the retail level cause greater effects further back, partly because of the need to build inventory buffers to hedge against transportation delays. IT helps the transportation system react to changes in the flow through the supply chain more quickly, reducing the size of these buffers.

INFORMATION-INTENSIVE LOGISTICS: FREIGHT TRANSPORTATION AND THE SUPPLY CHAIN

The key contributors to firm success in today's economy are shorter product life cycles, reduced product costs, and improved customer service. To achieve these goals, freight transportation must become more efficient. Much of the future gain in freight transportation efficiency from IT will come from integrating the information systems of shippers and actors in the freight transportation sector so that pickup and delivery are timely and reliable and, in addition, the transportation activities are invisible to the different actors in the supply chain. Investing in transportation support for the supply chain is important because of the large proportion of freight transport that is repeat business, such as P&G shipping to Wal-Mart or Chrysler obtaining parts from its suppliers. An important role for carriers to fill is the management of more than simply the transportation aspect of a shipper's business. There are several cases of carriers or terminals that extend their reach into the supply chain by managing shipper and consignee inventory and by managing the information flow between shipper and consignee. A good example is Britain's Transport Development Group (TDG), a logistics contractor that is moving into customer supply chain management and that owns 4,500 trucks. Starting from the design of information systems to manage the customer's process of ordering from suppliers, TDG is able to determine the supplier's shipments from the customer's orders, coordinate transportation using its own fleet or subcontracting to another fleet, and manage the inventory flows in and out of the customer's distribution center (Parker 1997). This is similar to vendor-managed inventory, where the vendor rather than the retailer is responsible for all the costs of holding and replenishing inventory at the retail locations.

Attempts to get integrated solutions within the freight transportation sector by vertical integration across modes or horizontal integration across geographical coverage areas are evidenced by the many mergers in rail, trucking, and global shipping (Richardson 1996). Large motor carriers have signed contracts with most railroads, so they only need direct control at the beginning and the end of the move (Bowman 1995), and they can provide door-to-door service. Express air carriers are already expanding to provide full logistics services including transportation, warehousing, customs clearance,

freight tracking, order processing, inventory control, and merchandise assembly (Conley 1996).

In cases where integration is not occurring by ownership, alliances are forming around complementary expertise. For example, although deregulation has allowed intermodally integrated direct carriers to compete against facilitators, carriers that are nonintegrated can work together with facilitators as a virtual network organization.²

IT COORDINATION COMPONENTS FOR TRANSPORTATION IN THE SUPPLY CHAIN

The supply chain's IT support needs correspond with phases in commercial trade:

- Precontractual, when requirements are determined, sources are discovered, offers are made, and negotiation takes place;
- Contractual, when purchase orders are issued and other conditions are agreed upon;
- Logistic, when transportation and distribution details are planned and executed; and
- Postdelivery, when invoicing, settlement, and reporting to industry associations and government are completed.

The Supply Chain Council, an industry group whose goal is to improve supply chain operations, has developed a framework called the Supply Chain Operations Reference model (*Insight* 1996). Part of the “deliver” process from this model is the transportation link in the chain. IT components for coordination of transportation in the supply chain need to support the following activities.

Demand Management

Information visibility is important not only for goods in transit but also for information about the (expected) demand for transport—informa-

² Facilitators are defined as actors that serve both shipper and carrier by consolidating small shipments into larger consignments, preparing shipments and issuing documents for intermodal movement, sometimes taking legal responsibility for goods in transit, providing through rates, performing pickup and delivery, and performing other functions to facilitate intermodal transport (Muller 1995).

tion that needs to pass through the supply chain. For example, in the packaged-goods industry, POS data, often in summarized form to ensure privacy, are electronically sent to the supplier and carrier, which in turn use the data to forecast, analyze, plan for, and sometimes execute actual orders. Thus, IT required by the carrier to manage demand must be able to collect the aggregated POS data, determine what orders are expected (or generate the order automatically), and pass this information to systems in order management and transportation and warehouse management. The information created and passed on for transportation purposes includes the logistics plan (cargo fees, pickup information, delivery point, CTA, spot, and carrier identification) and cargo information (cargo type, shipment condition, hazmat information, and safety handling). [Definitions of most of these items can be found elsewhere (TRB 1995).]

Order Management

These IT applications are the most routine, but they need to be integrated with the demand management systems. The applications include invoicing, accounts receivable and payable, credits, and collections. They may also require accounting specific to transportation—for example, invoicing for the use of one railroad's cars by another. These systems are the most amenable to EDI standards because they process generic business transactions.

Transportation and Warehouse Management

The transportation function is itself a moving warehouse, shifting inventory management onto the carrier. Thus, in a seamless supply chain warehousing is absorbed into the supply chain rather than dissolved, giving suppliers access to production schedules. Information systems required to support transportation management have to incorporate logistics planning, cargo information, the bill of lading, and regulatory and customs requirements. They also have to manage the in-transit operations and final delivery notice. If inventory management is also part of the function, additional information systems are required to capture the loading, receipt, and stocking of goods. Much

of the input information comes from the demand management systems, and some of the output information is communicated with the order management systems. Information components required for transportation management are the following:

- Logistics plan—routing plan, coloadng, load dock status, location of handoff, time of handoff;
- Cargo information—container identification, container condition;
- Bill of lading—cargo value, charges for transport, conditions for carriage and liability;
- Regulatory information—cargo permits, trip permits, credentials, certification;
- Customs information—spot, port identification, date and time of crossing, vehicle identification, vehicle profile, driver identification, driver visa, driver travel log, driver medical certificate, customs fees;
- In-transit information—routing management, time in/out, time/location, ETA, route change, location change, time of handoff change, status; and
- Destination information—delivery acceptance.

Intermodal has special information needs in each of the groupings, needs that are generated by two intermodal features. First, there is at least one additional actor (usually an additional carrier or a facilitator) that requires information about the shipment. Second, one or more additional handoffs need to be coordinated. Thus, the elements most critical to intermodal are those related to the additional handoffs: the logistics plan and the in-transit information in transportation and warehouse management.

TRANSPORTATION SYSTEM ORGANIZATION AND IT

To obtain gains in freight transportation efficiency from IT, the information systems of shippers and other actors must be integrated to support a supply chain in which the activities during transport are invisible to the shipper and consignee. Actors in freight transportation can use

two organizational structures to support the supply chain in this manner. The first is to integrate via ownership—for example, a single carrier owning assets to transport in different modes, and possibly owning the terminals for intermodal transfers. Federal Express, for example, has successfully integrated air, road, forwarders, and warehousing by using a hub-and-spoke system and using IT innovatively for coordination and control. However, the success of integrators such as Federal Express has not been replicated internationally. Moreover, the type of cargo transported, along with the manner in which it is transported, does not lend itself to the transport of most freight, which does not conform to the uniform standardized processes used by the integrators.

Surprisingly, not all integration has worked. For example, several railroads have had poor performance from their trucking subsidiaries (Muller 1995). This may be because the relevant assets of carriers are specific knowledge about their operations and location. When one carrier purchases another and then directs the new acquisition as part of its own operation to integrate its overall operations, the new acquisition is no longer free to use its specialized assets as before. As a result, many of the potential benefits of owning these assets are not exercised. Thus, it may be of little benefit to own (and direct) what you don't know.

Another approach has been for carriers to remain nonintegrated but to integrate aspects that would allow them to coordinate, such as information systems to coordinate intermodal movements. Systems built to replicate the information systems of the integrators, often referred to as cargo community systems, have consistently failed in practice (Forster and King 1995). The problem is that these systems, as constructed, do not have the incentive structures that compel the participants to provide the services necessary to gain the advantages of integrated transport. An example of this approach in passenger transport is computerized airline reservation systems, which allow the coordination of multiple flights on different airlines to support travel from origin to destination. Recent attempts (although unsuccessful) have been made to expand these systems to include hotel and rental car partners to further integrate travel support.

The alternative organization structure is the network organization. Although the network organization was originally conceived as a vertical combination of brokers, designers, marketers and distributors, producers, and suppliers (Miles and Snow 1992), there are many ver-

sions of horizontal network arrangements, such as franchises and alliances between health services organizations. An example of one such network is Pacific Pride Systems, which coordinates a franchise network of independent commercial fueling stations to serve motor carriers and other commercial vehicles (Nault 1997a). A customer's vehicle fleet can be served at any location on the network, and Pacific Pride uses IT to track purchases so that it can divide the proceeds between the serving station and the one that recruited the customer to use the fueling network, thereby rewarding both stations. The networks possible in freight transportation could incorporate different modes of transport, different regions, intermodal terminals, ports, third parties, and warehouses to serve shippers and consignees.

In an integrated firm the controls over activities by different units are provided by ownership and employment relationships within the firm. In addition to the characteristics of the freight they carry, this has been the reason why integrators have been able to develop information systems that so precisely coordinate and control their operations. In networks of independent organizations, contracts guide the activities of the various parties. These network arrangements are characterized by spillovers, whereby the actions of one party affect the outcomes of another or of the whole alliance. The contracts have to be designed to provide each party with an incentive to act in the interest of the network. With intermodal transfers, for example, the inbound carrier must be rewarded for providing cargo information to the terminal and the outbound carrier before the arrival of the cargo, and the information system must be able to support the transfer and verify that the inbound carrier fulfilled its information responsibilities. IT can help horizontal networks of independent entities operate as though they were more integrated by tracking the actions of the parties (for example, determining when the cargo information was provided) and rewarding these actions on the basis of the terms of the contract (Nault 1997a; Nault 1997b). It is in this way that contracts and IT must be intertwined to allow a network of independent parties to coordinate as an integrated operation.

The general approach to designing information systems to support this type of coordination is to determine which information assets are vital for coordination across the network and which are not. The former must be shared in some way between the actors in the transportation chain and the latter should remain private. Once this step is

completed, the timing of information sharing can be incorporated with the terms of the contracts in such a way as to motivate the independent actors to coordinate their activities as though they were integrated.

Consider a simple example of the transfer of intermodal cargo between two carriers through a terminal. Ignore the effects of regulations or customs. Using the information components outlined in a prior section, much of the information created from the demand management and the transportation and warehouse management activities must be provided by the inbound carrier to both the outbound carrier and the terminal well before the shipment arrives. Examples include the logistics plan and cargo information. While the shipment is under way, the logistics plan and cargo information must be updated by in-transit information from the inbound carrier and communicated to the terminal and the outbound carrier. Information must be updated and exchanged among the three parties at the time of the handoff. Although the terminal may only require notification about the final delivery, the outbound carrier must also constantly update the in-transit information from the second stage of the movement and provide this information to the inbound carrier—the one with the contract with the shipper. The latter information may also have to be communicated to the consignee if timely delivery or special notification is required, as would be the case if the consignee operates a JIT system.

The best way to design and implement IT that not only can support the operations but also can provide an incentive to carriers and other actors to coordinate complex freight movements is a current area of study, both in practice and in research institutions.

STATE OF USE OF EDI

The objective of EDI was to standardize the content of a reasonably complete commercial transaction set—the set of documents required to execute a variety of business transactions. With this transaction set, a firm could do business electronically with any other firm that could receive and send messages using the same transaction set. Thus, EDI is an initial step in the use of IT in transportation, automating the exchange of business documents. The transaction set was operationalized as a set of protocols for different messages—that is, how the mes-

sage was organized so a computer could be programmed to recognize and access the appropriate fields of information, and as a set of rules defining what the messages mean. In the early stages EDI achieved significant successes. For example, in the late 1980s some organizations increased sales up to 50 percent with electronic ordering (La Londe and Cooper 1989). Moreover, there were predictions of rapid growth in EDI usage (Walton and Lewis 1995).

Two practical problems have emerged. The first is one of standards. As with many attempts at setting standards, more than one standard emerged.³ The North American standard is ANSI X12, and the rest of the world has adopted the United Nations-sanctioned EDIFACT standard. The ANSI X12 and EDIFACT transaction sets are not perfectly compatible. This means that although some of the basic business transactions can be translated between the two standards, the more detailed messages and transactions from one standard cannot be translated into the other standard without some loss of content. The analogous situation arises with business processes—on the surface, transactions between firms have a consistent structure. Good examples are purchase orders and invoices. However, even these transaction documents differ between industries, and an electronic standard cannot capture the industry-specific (or firm-specific) aspects.

The second practical problem is that EDI has been costly and time-consuming to integrate into firms' existing information systems. When EDI is connected to existing internal systems, it typically automates existing business processes. Unfortunately, most of the gains from IT come from the integration of this technology into business processes, changing how firms do business. To support the redesigned business process, it is often necessary to incorporate IT into processes, requiring information in a firm- or industry-specific form—exactly what EDI was designed to avoid.

Surveys of the freight transportation industry indicate that the adoption of EDI has not been at all universal in any dimension. Carriers that

³ Other examples include the Beta and VHS standards in videocassette recorders and different bandwidths of Integrated Services Digital Network (ISDN) standards between North America and Europe. In the former, the product that was inferior in most technological dimensions (VHS) prevailed because of the proliferation of VHS machines, and the different standards have been part of the reason why ISDN has been so slow to develop commercially.

have adopted EDI have used only a limited amount of the transaction set. Specifically, increased use of exception-type sets—messages designed to communicate status and instructions to deal with nonroutine situations—has not materialized (Crum et al. 1996). Because exception reporting is more firm and industry specific than what is needed when transactions are routine, the lack of use of these sets may be due to that type of reporting not being compatible with standards. Moreover, of those that had adopted EDI, only 28 percent had “integrated” EDI into their other systems before 1994 (Walton 1994). This indicates that EDI has not been incorporated into internal systems, but rather has automated existing manual processes. Supporting this view, it was found that truckload industry usage of EDI was much greater than that of the less-than-truckload industry, possibly because it is simpler to integrate EDI into truckload industry operations. In addition, there were more direct EDI linkages to internal systems, such as customer service, finance, and operations, than intermodal EDI links, suggesting that it is easier to enforce standards internally (Crum et al. 1996).

The driving force behind adoption of EDI in the freight transportation sector has been the exercise of shipper channel power, rather than carriers attempting to attain greater efficiency (Crum et al. 1996; Walton 1994). These powerful partners force EDI on carriers, which are faced with paying surcharges or losing business otherwise (Walton 1996). Shippers benefit from EDI because they are able to implement their own plans to improve the efficiency of their supply chains using EDI to automate the order and transport process. This is consistent with the finding that reducing different demand uncertainties is the key reason why marketing channels (as opposed to logistics channels) adopt EDI (Walton 1994). This helps explain why carriers find that their EDI advantages, such as service, competitiveness, and differentiation, are related to marketing as opposed to operational efficiencies (Crum et al. 1996).

Thus, instead of internal stakeholders, external stakeholders have the most influence over EDI adoption. As a result, initiators of EDI adoption in organizations are not corporate offices but line departments such as purchasing (Walton and Lewis 1995). Management information systems departments, which would be expected to support EDI, are not proactive because of their backlogs on other systems. Therefore, EDI is not being organizationally initiated or controlled.

The EDI technology itself was not found to be the deterrent; rather, the deterrent was bringing EDI into the business process (Crum et al. 1996). As hypothesized here, the large gains from IT are in the redesign of business processes, and this redesign is more difficult for firms to implement than the automation of existing business processes with EDI. EDI requires organizational standardization—standardization that would reduce many advantages of successful firms, such as barriers to entry, know-how, and specialization.

PUBLIC INVOLVEMENT

Government involvement in the national freight transportation system should be based on what the private sector can be expected to do and what it cannot. In general, the private sector cannot be expected to invest heavily in “public goods”—that is, items that many parties have access to, such as the National Highway System. There are two reasons why the private sector does not have incentives to invest in these items. The first is that a given private party may wait until other private parties invest, hoping to free ride on their investment. As a result, everyone waits and there is no investment. The second is that a given party may not be able to capture the full return on joint investment and thus underinvests.

This means that government should invest in items that can create a common benefit. Government policy and involvement can be modified in several ways to accelerate efficiency and coordination gains from IT in the freight transportation sector.

IT Infrastructure for Transportation

The most basic requirement to support IT in the freight transportation system is investment in IT infrastructure. Underlying most of the examples in this paper has been reliable and relatively inexpensive communication within the transportation sector, between the transportation sector and the production sector, and between the transportation sector and government bodies. The communications infrastructure used in these examples has been proprietary, as with Chrysler using its own EDI network (Chrysler Telecommunications Exchange), pay-per-use with

value-added-networks, or even simple modem transmissions over normal telephone lines.

To ensure the participation of all the actors in the freight transportation sector, a next-generation Internet or some other public communications backbone is needed to ensure connectivity and bandwidth. Interestingly, Internet EDI has been considered the “killer application” (the software application that makes something commercially viable) to usher the Internet into mainstream information systems (Nash 1996). The existing Internet is congested, is not secure, and has intermittent failures, and as a result it cannot provide this connectivity in its current form. Standardization and development of an architecture are needed so that future data handling systems will be interoperable—the standardization of infrastructure and connectivity. In this domain government can play an important leadership role (TRB 1995). For example, government can begin by determining, in concert with the transportation sector, the levels of security and bandwidth required in a communications network exclusively serving freight transportation. Government may also take the lead in designing such a network to be self-funding. The government’s critical involvement in the development of the Internet is a precedent for this activity.

EDI “Standards”

As indicated by the examples of current trends in the use of IT for coordination, intelligent communications need to enable business processes that go across the supply chain, allowing plans and activities to be synchronized across firms. Despite a great deal of effort in development, protocol standards such as EDI ANSI X12 are not sufficient for this type of communication because they cannot incorporate the richness of information transferred between firms. Moreover, these standards will always lag innovations in interfirm coordination because it takes time to establish the standard after a particular kind of communication has been shown to be useful.

Certain areas of organization-to-organization communications can be routinized. A good example is customs documentation. The U.S. Customs Service’s Automated Manifest System and Singapore’s TradeNet, both of which allow for the automated clearance of

imported shipments, are excellent examples of successful government initiatives using EDI. Efforts in developing EDI standards might be better focused on customs and regulatory interactions, most of which are routinizable, rather than within- or between-industry interactions, which tend to be more specific because they are more deeply integrated with the individual participant's internal business processes.

Customs and Regulation Systems

Some centralization of information systems is needed for coordination between different actors in the transportation sector and between these actors and regulators/customs. One success noted above is the Automated Manifest System of the U.S. Customs Service. Other initiatives include the North America Trade Automation Prototype (NATAP), the Federal Highway Administration's Commercial Vehicle Operations Vision, the Association of American Railroads' Interline Service Management, and various projects in the U.S. Department of Transportation's Intelligent Transportation Systems program (TRB 1995). The common thread through these activities is the need for coordination between different actors with different motivations.

The success of these and other systems may require simplifying international trade agreements and other government-based institutional arrangements. Each of the initiatives listed above has required both applications of IT and changes in fundamental processes. For example, NATAP—a system to allow nonstop movement of freight across borders using radio frequency devices—requires the United States, Canada, and Mexico to follow through on their North America Free Trade Agreement commitment to harmonize the substance and electronic communication of customs documentation. Similar agreements are required to implement the coordination of IT for the other initiatives. Support for these initiatives can be direct, with government being one of the participants, or indirect, with government not being an active participant.

Education

With the trend toward increased electronic communication to support transportation, there are many concerns among those in the transporta-

tion sector concerning the ease of use of new IT and security of information in the communications. It is difficult for single organizations to continuously upgrade their knowledge in these areas because in-house education is expensive and experts are hard to obtain. Other reports have also suggested that outreach education for corporations and individuals is needed to answer concerns about privacy and usability (TRB 1995). In fact, lack of education and expertise is a serious impediment to using IT to improve the efficiency of the freight transportation system. Government can play an important role in helping firms overcome these obstacles by supporting education in this domain through direct outreach programs and through support to industry groups.

There is a related problem whereby the freight transportation sector has produced much redundant software and other technological components (Andel 1997). In the face of fast-changing technologies, the process of innovation is bound to produce some redundancies. Nonetheless, government can certainly play an important role in technology transfer by maintaining information on IT innovations used in the transportation sector and diffusing the information to potential developers and users.

CONCLUSION

This paper has examined the contributions of IT to efficiency gains in freight transportation. Even ignoring operational efficiencies, it has been found that IT applied strictly to interorganization information exchanges could reduce total freight transportation industry expenditures by one-eighth to one-fourth, some \$45 billion to \$90 billion in 1992 in the United States. EDI has created gains associated with automation for individual firms. However, progress toward further gains has been partially stalled because of the difficulty of integrating globally standardized business communications into the information systems of firms that maintain business processes that are specific to the relationships they hold with other firms. Moreover, much of the earlier progress consisted of marketing-based as opposed to operations-based gains.

The prospects of additional gains from IT, some of which are being captured by transportation firms on the cutting edge, come

mostly from using IT to coordinate transportation and the supply chain. Better information on the demand for shipment capacity (derived from demand for the to-be-shipped goods), allowing transportation to be planned and executed more reliably, has made the substitution between information and inventory feasible. In addition, reliability and real-time visibility of shipments in the transportation pipeline have made it possible to use this pipeline itself as inventory. There are associated gains from IT directly in transportation operations that allow terminals, ports, and carriers to better utilize their large transportation assets. These benefits arise essentially because information systems tracking makes both the assets and shipments more visible, meaning that pickups, transfers, customs and regulatory reporting, and deliveries can be handled more efficiently.

The difficulty of coordinating activities between the different actors in the freight transportation sector is hindering realization of the potential gains. Vertical integration has only been successful in limited settings, for example, integrators such as Federal Express and UPS. Building information systems to support the different independent actors in nonintegrated transportation has suffered because of the lack of incentives to jointly develop these systems. It is argued here that different types of approaches to organize different actors in individual transportation and supply chain relationships, where the specific character of the business processes in those relationships can be supported, is necessary.

It is suggested that efforts to extend EDI standards need to be carefully targeted to those communications where the underlying processes are or can be routinized. Efforts at further standardizing electronic communications for business processes are unlikely to yield expected benefits because these processes differ between industries and even between firms—and these differences may in fact be part of a firm's competitive advantage.

However, public policy has a significant role to play in providing IT infrastructure as an electronic platform for communications to coordinate freight transportation activities, in providing systems initiatives for firms' routine documentation exchanges with customs and regulatory bodies, and in providing outreach education and support for technology transfer in the freight transportation sector.

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Abbreviations

FHWA	Federal Highway Administration
TRB	Transportation Research Board

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Public-Sector Financing in Intermodal Freight Transportation

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Like the legendary final exam question, “Define the universe and give two examples,” specifying and sorting out issues surrounding the role of the public sector in financing improvements to intermodal freight facilities and systems is a daunting task. The universe of issues with which one must deal is unique because any given intermodal project can involve such a galaxy of actors of different sizes, shapes, and motivations. The objective of intermodal freight may be seamless transportation, but the diverse funding sources and devices that may need to be sown into a financial package render results that are anything but seamless.

Such situation-specific characteristics make generalizations hazardous. Since no national public financing program has ever been designed specifically for intermodal freight transportation, much less institutionalized, it suffers from a lack of “organizing principles.” There is no standardization of financing types and techniques, as is usually found in the analysis of an individual mode of transportation. At the same time, because the concept of intermodalism deals with making several components integrate to accomplish a purpose, it offers one of the better examples of blending abutting, but diverse, interests and the

interplay of a variety of economic motivations. That same mixing will be found in the financing packages put together to date.

The approach taken in this paper is to examine first the rationale for public financial involvement in intermodal freight projects and then to examine what it takes to make such an intermodal project "financible," offering a number of examples and analogies. It is assumed that there is a large degree of public interest in making the freight flow better through a particular facility (most likely a seaport, railhead, or airport), but it is not assumed that public money will necessarily be forthcoming. Rather, the practical difficulties of rounding up sufficient money to make intermodal improvements are described, and how the public sector might help in the process is discussed.

Since no specific aid programs have been targeted to intermodal freight projects, the descriptive parts of this paper will necessarily illustrate the financing problems and solutions with examples taken both from generic infrastructure projects and the patchwork of specific solutions that are now being devised to fit the occasional intermodal project. Most public-sector financial involvement in intermodal freight projects has been inventive and derivative, springing from programs designed for the dominant modes that will use the facility. Whereas an intermodally shared benefit may be derived, the financing is cobbled together from the traditional sources of funds and funding techniques that are required to handle the specific parties of interest.

Much of the emphasis is on how leveraging limited amounts of public money can entice primarily private-sector investments. Even the most ardent advocate of public funding realizes that grant money from federal, state, and local government sources is in short supply and typically programmed years in advance. Furthermore, intermodal freight programs, by definition, represent a mixture of transportation modes. The resulting admixtures of public and private funding sources reflect that the programs are often viewed as only supportive of or tangential to the primary mission of the particular media. Thus, funds drawn from a scattering of federal, state, local, and private sources that have been cobbled together to finance a particular project will be examined.

A summary of the principal findings of this paper follow. It is hoped that the commentary that follows will provide the illustrations and arguments needed to justify the major conclusions.

- Public financing of intermodal facilities has usually occurred as a result of “market failure,” that is, where the nature of the benefits and risks makes purely private financing incapable of supplying enough of the needed good or service. That is an appropriate reason for governmental intervention.

- Most financing for most intermodal projects should be provided by local and state governments and by the primary beneficiaries in the private sector.

- Direct federal government involvement in projects has been, and should be, restricted to projects where there is a compelling national interest. That appears to be in the relatively few cases where there are major points of international entry or major national railheads that are critical to national security and the performance of the economy.

- Where there is federal intervention, it should be of such a nature as to reduce risks for subnational governments and private investors, leveraging nonfederal investment funds and preserving appropriate risk sharing among the participants. Essentially, this demands a surgical and limited use of federal assistance as a catalyst for projects that otherwise make good long-range economic sense.

- Many financing techniques are available to achieve the preceding strategy. As a general proposition, the creative application of existing federal grant programs to meet specific intermodal projects appears to provide the needed resources and flexibility.

DEFINITIONS AND DISTINCTIONS

Intermodal freight has been defined by one expert as “transporting freight between different modes in such a way as that all parts of the transportation process are efficiently connected and coordinated, offering flexibility” (Muller 1996, 1). The focus of the definition is on the objective of the process; for example, the U.S. Department of Transportation defines it as “the goal of transporting goods by multiple modes more efficiently” (DOT 1995, Vol. 2, 1-1).

As a practical matter, the concept of intermodal focuses on the points of connection where freight is transferred among freight vehicles representing different transportation modes such as trucks, ships, rail, and airplanes. Thus, we are concerned about financing improved

port facilities, yards, and freight-handling terminals, including improving how these sites are accessed and connected and the extent to which making cargoes and freight more easily transferred benefits both users of the facilities and others.

Like other areas of the economy, ports and terminals have become increasingly capital intensive and mechanized in recent years. The move toward containerization (shipments that stay in the same container as they are transshipped) has embodied and enlivened the concept of multimodalism. Although first introduced in the 1920s, containerization accelerated after World War II and has come to dominate the freight hauling scene over the past 20 years. In a nutshell, shipping big, mobile containers has dramatically changed the profile of ocean traffic and its relationship to rail traffic, and the profile of rail traffic and its relationship to truck traffic. Growth also came about as ships began to unload cargoes in the 1970s at West Coast ports and ship by rail across the United States and to the Gulf or East Coast for transshipment to Europe (landbridge service). At the same time, the competition for long-distance traffic between trucking and rail was transmuted to cooperation, with the latter mode recouping much of its long-haul business as containers from trucks increasingly were loaded onto railcars. Although traffic in the form of rail container shipments does not represent the full measure of intermodal activity, it is a reasonable proxy for where the most significant intermodal activity and problems are likely to occur. Major intermodal container routes are from the Southern California ports to the Midwest, especially to Chicago, and between Chicago and New York. GAO has estimated that almost half of all intermodal shipments originate, end, or connect through Chicago and that they generate at least 8,000 truck trips per day in that city.

Progress in freight intermodalism has been due both to deregulation and competitive pressure among shippers and facilities. Technology and economies of scale are driving much of the demand for better and larger intermodal facilities. Major international shippers are continuing to consolidate and to purchase larger ships. Whereas current ships carry 3,000 to 4,000 twenty-foot-equivalent containers (TEUs), the newest ships are of the 5,000-TEU size. These loads will put pressure not only on port facilities but also on surrounding transportation structures as they seek to unload and turn around quickly. Overall, however, the enhanced technology should lower overall logistics costs,

which include transportation and inventory costs, that can account for as much as 25 to 35 percent of the price of final goods (DOT 1995, Vol. 1, 1-8). But an inhibition on the greater flow through ports and terminals can be the congestion of the surrounding areas and at distribution points down line.

WHAT IS THE PUBLIC INTEREST?

Of course, the changing technology and patterns of freight movement do not in themselves make a case for greater public involvement or financial assistance. To assert that case, there must be convincing evidence that there are economies or diseconomies that the existing market-oriented system, including the existing framework of regulation, is not adequately taking account of and, therefore, that some form of governmental involvement is needed to make intermodalism work better. Forms of governmental involvement may range from the lightest hand of information gathering and sharing, to cooperative planning, to active regulation, to deep-pocket financial subsidies that seek to leverage actors toward the appropriate behavior. The appropriate remedy depends on the diagnosis, the nature and severity of the problem, the degree of public interest involved, and the priorities of the policy makers.

As a practical matter, the evolution of transportation in the United States, as elsewhere, means that governments are already knee-deep in all forms of freight transportation and intermodalism by virtue of their regulatory powers and the various facilities that they own and operate. The trucking, water transport, rail, and airline companies may be privately owned, but the landside facilities they use and the routes they traverse are owned or regulated (or both) by the government sector. The other practical reality is that intermodal shipping and the facilities it represents are big economic factors for many state and local governments: jobs, incomes, and taxes all depend on where the facilities are located and how they fare. Many governments already subsidize port and terminal operations and many more are willing to do so if it will help inspire local prosperity.

Several arguments for governmental involvement have been made. Here our primary concern is what these arguments, to the degree they

are valid, tell us by way of designing efficient means of providing financial resources. But means of assistance that are logically compelling to the economist may make no headway with politicians or financiers, who are always concerned with what is feasible in their respective and overlapping spheres. Only seldom are major government programs and their respective benefits and costs put on the block for public debate (funding the supersonic transport in the 1960s, the Supercollider and Star Wars in the 1980s, and health insurance and welfare reform in the early and mid-1990s). Usually, the areas are addressed in an ad hoc and piecemeal way; existing programs are tweaked and stretched to meet new constituencies and needs as they emerge and gain sufficient political support.

The rationale for providing more governmental assistance to intermodal freight revolves around the benefits to society and the economy anticipated from accelerating and ensuring improvements in the existing freight-handling system. The key specific “public good” benefits ascribed to improved intermodal transportation may be summarized as follows:¹

- Lower transportation costs;
- Reduced energy consumption and improvements in air quality and other environmental conditions;
- Reduced congestion and less time lost;
- Higher returns from public and private infrastructure investment through more efficient use;
- Better options for shippers, less damage to shipments, reduced paperwork, and so forth;
- Safer operations by reduction of fatigue and congestion; and
- Enhanced national military and economic security.

Theoretically, most of these advantages represent benefits where the prices arising by the workings of the free market fail to provide suf-

¹ The list is a composite of advantages but is subject to interpretation. For example, according to some studies, shipping comparable freight long distance by rail is more than three times more efficient than movement by truck and leads to only one-fifth the emission of hydrocarbons. However, shipping by rail is slower, less reliable, and more prone to damage, and so it may be more expensive for shippers in the final analysis.

ficient indications of the full social and economic “costs” incurred or the market is incapable of assuring private parties that make needed investments to achieve such benefits that they have a prospect for a competitive return on their investments. Where there is market failure, it is up to government authorities either to (a) directly intervene and themselves make, or mandate that others make, improvements, or (b) otherwise seek to nudge the markets to send signals that better “price out” intermodal benefits. One way or another, the desired projects will be examined in a framework that compares the benefits with the cost of making improvements.

Cost-benefit analyses at various levels of sophistication attempt to provide a rational if often imprecise way of making comparisons, both of the benefits and costs of individual projects and among competing projects. Such exercises require numerous assumptions, and the analyses can be complex and controversial, as discussed later. Still, the need to compare benefits with costs raises the right questions, even if the answers are difficult to quantify and are only partial. The difficulties involved in cost-benefit analyses as applied to intermodal projects are examined, and it is noted that economic benefits are not the same thing as financial feasibility. The gap between economic benefits of a public nature and the financial feasibility of a given project in a private market environment is a major argument for public financial involvement.

Costs and benefits and the ability to mobilize resources to make improvements that benefit the general public are very much tied to the nature of the industry in question. Freight hauling is a very competitive business. In the United States air carriers, railroads, truckers, and shipping firms are private, profit-seeking businesses. There is not only competition among the individual private-sector haulers, but also locally and regionally among the various ports and terminals, the facilities of which may be either publicly or privately owned. The intermodal facilities and allied supporting improvements where two or more freight-hauling modes linkup can require heavy investment. But changing technologies and trade patterns can torpedo business plans and lead to losses on sunk investment. The first problem is that major investments must be made if businesses and the sites at which they are located are to stay competitive. The other problem is that the site (and the governmental jurisdiction that inhabits it) by definition is geographically specific, but the firm or the industry most likely is not.

Since the modes of transportation and their facilities are themselves sources of jobs and income and as major destination and transfer points they draw other jobs and income, the siting and competitive condition of facilities are a major economic concern of the host political jurisdiction. In the case of numerous ports and terminals and airports, the vital economic role of the facilities has been underscored by the recent downsizing and abandonment of U.S. military bases. These surplus facilities and the idled workers that go with them have added to the heated competition among competing jurisdictions that, having the idle facilities at hand, strive to retool into private-sector operations.

PROVIDING FACILITIES: TRADITIONAL PRACTICES AND POLICIES

As noted, the prevailing condition of the freight industry is for the mode to be privately owned but the connection points (ports and terminals) and supporting infrastructure (roads, bridges, and utilities) to be under public ownership. This can vary by mode and the specific nature of the facility. Intermodal facilities in the rail and trucking industries are usually privately owned, whereas those in water shipping and air transportation are mixed, and there is a large element of public ownership and control at major airports and seaports. Of the various types of freight terminals, only those at airports have received some federal (as opposed to state and local government) assistance. Consequently, federal and other governmental financial involvement is greatest in the port and airport facilities. In each of the latter two cases, the size and traffic effects of the facility (and, in the case of water shipping, the locational uniqueness and density of activity), national defense implications, and the need for large ancillary services and regulation makes the governmental interest substantial. Furthermore, the continuing growth in airport traffic and international trade have brought these facilities into focus as economic growth generators. In all cases, airport, seaport, and rail terminals represent major economic engines and investments in the region.

Intermodal facility investment presents a hodgepodge of private financing sources, ranging from the decreasing number of major railroads to vast numbers of independent trucking operators. Present-day

financing packages for intermodal facilities reflect the traditional patterns of financing used in the various modes and depend largely on which mode is dominant in the particular project or transaction. Railroads, with the exception of passenger-related facilities, are heavily reliant on private capital for rolling stock and terminals. Money for these facilities is raised from the public securities markets in the form of bond and stock sales, from bank loans, and from internally generated funds. Seaports and airports, which are usually controlled by state or local government and have large supporting facilities, reflect heavy use of tax-exempt bonds.

Supporting infrastructure, such as road transportation networks and bridges that support the operations of terminals and harbors, are typically financed by public bodies using intergovernmental grants, current revenues, and bond funds. An example of a major project where any federal assistance was eschewed is provided by the package-handling facility in Willow Springs, Illinois.

Most intermodal improvements are made without direct federal involvement, and even major projects may really be a matter between the benefiting companies and the host state and local jurisdictions. The new package consolidation intermodal facility at Willow Springs, while in some respects novel, was a public-private cooperative effort between United Parcel Service, Santa Fe Railroad, the Illinois Department of Transportation, and the Illinois Toll Road Authority. The \$250 million facility included about \$24 million in highway access improvements funded by the two state agencies with no federal money. The parties reportedly did not want to slow down the project in hopes of getting federal funds. An important point is that in many cases most of the investment will likely be private and that the government's role is likely to be that of providing access and supporting infrastructure. Another is that when relatively few parties are involved, the financing job may be easier to accomplish.

Whereas a few states have multimodal state programs (usually aimed at the trucking/rail nexus), most have no formal program and tend to take major efforts on a project-by-project basis. The usual state government focus has been on the seaports and associated port authorities, which own parts of the facilities, may house privately owned facilities, and may compete with adjacent privately owned facilities. Because many primary intermodal facilities are privately owned, as are the modes that frequent

them, the private sector is responsible for the largest portion of the investment in intermodal facilities.

The focus of virtually all federal and most state and local transportation programs has been on moving people first, movement of goods typically being an afterthought. Several factors account for this, including a lack of information about intermodal practices and funds spent on intermodal research. Additional research is needed on freight movements and avoidance of tie-ups. The awareness is growing that much of national efficiency and productivity depend on just-in-time inventory policies. These policies have put a premium on rapid, dependable shipment, and the diminution of inventory buildups has been cited as a factor in the long-running strength of the present economic cycle. But part of the problem is visibility; in the case of freight, fewer goods are shipped locally than are shipped nationally and internationally (GAO 1996b).

FEDERAL AID FOR INTERMODAL FREIGHT

The traditional structure of federal aid to transportation has been along fairly strict modal lines, and most aid mechanisms continue to be modular in character. Intermodal transportation did get some early legislative recognition, but the emphasis was on passenger traffic rather than freight. The most recent omnibus transportation act, the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), identified an interest in intermodal surface transportation but gave only nodding recognition to intermodal freight and did not set aside specific aid funding categories for it.

But freight traffic needs began to get more attention. Private shippers, reacting both to new trade patterns and extensive deregulation, provided the impetus to the change for intermodalism as freight volumes surged in the 1980s. The growing importance of trade and container shipping, combinations of firms and modes in international trade, and just-in-time inventory techniques all served to increase the demand for larger, more sophisticated facilities. Whereas a greater role placed on high-value shipments generated increasing traffic for rail and air, the huge tonnage of oceangoing ships placed great pressure on ports to upgrade, especially to handle container shipping. The competition

among facilities and ports quickly translated into competition among cities and regions as they sought to preserve and enhance economic activity in their areas.

Because no federally funded programs are specifically directed at intermodal freight projects, such projects have tended to be novel and complex and are either nominally eligible to compete for access to a wide spectrum of funds or are designated by Congress as special “demonstration” projects. ISTEA made intermodal projects eligible in concept but placed a number of impediments in the way of their actually getting funding. Specifically, ISTEA is predominantly oriented toward highways and returning highway-use taxes to the mode that finances the program. ISTEA, aside from using intermodal in the name, nominally gave freight a key role in consideration, stating that the system “shall provide improved access to ports and airports, the Nation’s link to world commerce.” But in substance, the link eligible for federal aid is the highway and, occasionally, the transit part of an intermodal project. Last, ISTEA allowed the states and the local planning agencies to set the priorities, and freight transportation matters, dominated by private transportation and shipping firms, were largely unknown.

The accompanying box provides a brief overview of the highway programs authorized under ISTEA that are potential funding sources for intermodal freight projects.

Spending progress has been slow, according to the General Accounting Office (GAO). As of September 1995, 10 states had allocated about \$36 million in ISTEA funds for intermodal freight projects, and as of December 1995, an additional \$68 million (of \$192 million authorized) had been allocated on 20 “priority” or demonstration intermodal freight projects.² The total amount of ISTEA funds apportioned by the states specifically to intermodal freight projects represented less than 1 percent of ISTEA funds apportioned. According to GAO, major impediments have been the lack of familiarity of transportation planners with intermodal freight and lack of data and coordination of public-private planning. Another has been the widespread restrictions on highway-based revenues at the state level that restrict

² By way of illustration, ISTEA contained some 500 specifically named demonstration projects.

Major Federal Aid Sources for Intermodal Freight (DOT 1995, Vol. 2)

Congestion Mitigation and Air Quality (CMAQ)

Total funds: \$6 billion over 6 years.

Intermodal eligibility: Projects that contribute to air quality improvements in nonattainment areas. Intermodal rail and barge projects have qualified by displacing truck traffic.

National Highway System

Total funds: \$21 billion over 6 years.

Intermodal eligibility: Can be used to improve most highway networks that accommodate intermodal movements including highway and rail freight.

Surface Transportation Program (STP)

Total funds: \$23.9 billion over 6 years.

Intermodal eligibility: Almost any road improvement except local or rural collectors but excluding rail freight facilities. Road improvements to accommodate intermodal are eligible.

STP Transportation Enhancements

Total funds: 10 percent of STP

Intermodal eligibility: Any intermodal project that rehabilitates a historic facility, including preservation of rail corridors.

Bridge Replacement and Rehabilitation Program

Total funds: \$16.1 billion over 6 years.

Intermodal eligibility: Bridge improvements to accommodate truck and rail movements, including bridge clearance.

Priority Intermodal Projects (Demonstration Projects)

Total funds: \$437 million over 6 years.

Intermodal eligibility: Virtually any road-related project, but must be among 51 intermodal projects designated by Congress. They include interchanges, rail relocation, road/rail separations, and terminal access.

use to highway-related projects. Meanwhile, the U.S. Department of Transportation (DOT), reliant on the states to come up with ideas and with no special pot of its own aside from the demonstration grants, has played the role of broker, helping to stitch together aid from the existing program funding pots (GAO 1996a, 3).³

Part of the problem is intermodal's lack of visibility and getting into the queue of priorities. Metropolitan planning organizations (MPOs), which have the local level responsibility of planning in urban areas (areas with population exceeding 50,000), have 15 planning factors prescribed in prioritizing projects, only 2 of which relate to intermodal freight. Moreover, public planners are not used to dealing with freight problems and find it difficult to get information about freight movements from private firms, which consider it to be proprietary (GAO 1996a, 2).⁴

Advocates of intermodal freight have argued for expanded eligibility to compete with the broad spectrum of highway-oriented programs (National Commission on Intermodal Transportation 1994, 4). Whereas the highway component of an intermodal project is probably eligible for an allocation of highway funds, the highway funds are programmed many years in advance, and both law and bureaucratic inertia at the state level tend to make diversions difficult. Not surprisingly, intermodal projects have had better luck in competing for money in the newer programs like CMAQ that address air pollution and congestion since queues are shorter.

Innovative financing has been a driving force in much of the thinking at DOT, both for highway and nonhighway financings. The essence of the idea has been to develop ways in which the traditional grant funds could be stretched both horizontally across a broader spectrum of uses (i.e., other than just the modal-specific uses) and vertically (to leverage more nonfederal dollars, either by larger contributions from state and local governments or, even more innovatively, by using private-sector "privatization" funds).

³ GAO concluded that since freight is moved by private companies, most investment in intermodal facilities is done by them in private facilities. The report also faults DOT for (a) not defining intermodal and (b) not moving to collect investment information as was required by ISTEA.

⁴ The two factors are "methods to enhance the efficient movement of freight" and "access to ports, airports, intermodal transportation facilities, major freight routes . . ."

Two programs initiated by DOT of an innovative nature have been important of late and either have already assisted or hold promise for intermodal applications. In November 1995 a 10-state pilot State Infrastructure Bank (SIB) plan passed as part of the 1995 National Highway System Designation Act, and in January 1996 applications went out. The act allows states to allocate 10 percent of their federal apportionment to capitalize the SIB with a 25 percent state matching requirement. The other and related program was the Federal Highway Administration's (FHWA's) Innovative Financing—Test and Evaluation Project (TE-045), which was undertaken to stimulate more flexible transportation financing techniques in response to Executive Order 12893. During 1994 FHWA solicited proposals from the states and, under the rubric of research, started to “flex” various rules and regulations to speed up and expand participation in projects (FHWA 1994).

The innovative financing research and pilot proposal work has been an effort to stir more creativity and commitment on the part of state and local governments and the private sector to accelerate spending on highways and other transportation. The SIB proposal represents an effort to make bond financing and credit enhancements, as are discussed later, more important financing tools at the state and local level, where more heavy lifting will be required to match national transportation needs and goals. SIBs would have great flexibility in terms of types of programs and assistance they might render, as is discussed later. An important objective of the TE-045 and SIB pilot programs has been testing changes in the next ISTEA reauthorization.

The administration proposal for reauthorization of ISTEA, which was launched in early 1997 and called NEXTEA, was a disappointment to those who had hoped for a more aggressive stance on innovative financing.⁵ The bill asked for only \$150 million per year for establishing the new SIBs and proposes a new line of credit facility, but at only \$100 million per year. Besides a small funding level, the administration bill calls for the adhesion of certain federal requirements on funds lent by the SIBs, even if those funds are to be repaid by state sources. The most troublesome requirement is that of requiring the

⁵ NEXTEA stands for National Economic Crossroads Transportation Efficiency Act. It retains virtually all the core programs of ISTEA, including those that have been sources for intermodal aid. However, as yet there are no demonstration projects.

prevailing wage standard (Davis Bacon) on SIB loans, which drives up construction costs and is viewed as an intrusion into the labor and employment policies of states.⁶

There had been hope that the next version of ISTEA would call for a relaxation of the tax-exempt bond financing provisions as regards privately managed toll facilities and an explicit subordinated loan program (as opposed to the special legislation forms that have been used to date). The proposal also permits states to levy tolls on Interstate highways, which, by providing new revenue, would allow bond sales to finance other highway improvements. Still, on balance, the proposal is devoid of bold initiatives in transportation finance, increased infrastructure spending having taken a back seat to the more politically popular education initiatives (Eurich 1997).

STRUCTURING A FINANCING PACKAGE

By the nature of the projects, federal funds have and will continue to have a limited role to play. The bulk of the financing package will involve the other two sectors: state and local government and private resources. How are these to be tapped? Developing guiding principles is difficult because intermodal facilities come in diverse packages and incorporate financing techniques that are tied to the individual transportation media that may be involved.

At the outset, several questions are to be answered:

- Who benefits from the improvements?
- Who should pay for the improvements?
- Who should own and operate them?
- Who should finance them?
- How can they be financed most effectively?

Conventional wisdom is that the first two aspects—benefit and payment—should be closely tied concepts. But, with public-sector

⁶ The prevailing wage standard is a favorite restriction of organized labor, since it forces contractors to basically pay the union scale and undercuts the advantage of using lower-paid, nonunion labor.

involvement, there is at least a presumption that payments are not exclusively anchored in benefits. Furthermore, as the debates about regulation (and deregulation, and reregulation) and public versus private ownership continually inform us, there is no compelling reason why a public interest requires public ownership. Furthermore, the act of financing can be divorced from benefit, payment, and ownership, as when a government acts as an intermediary, again with the presumption that there is some larger public interest to be served. Finally, since public financial involvement is the key consideration in this paper, involvement in the most effective manner is a chief concern.

User Pays Versus General Support

In the ideal world of the economist, all goods and services can be rationally categorized into components that benefit private individuals versus the public at large, and costs can be apportioned among individuals and socially to match the benefits. Unfortunately for economists, the real world is far from decided about what are private versus public benefits and associated costs and how they should be measured and allocated. However, even in this world of rough justice, there are some useful guidelines when it comes to financing improvements.

User-pay revenue systems work well as a financing device when the following conditions are found:

- The nature of the service is essential; there are no close substitutes for it.
- Consumption of the service is exhaustive and competitive among consumers.
- Consumption of the service can be measured and revenues collected easily.

Examples of vital utilities that are commonly supported by user charges include water, sewer, electric power, and various types of strategically placed toll facilities where traffic needs are high and there are few competing facilities. Highly developed user-pay systems are found in the basic utilities, which may be either publicly or privately owned and operated. An important aspect of the utility from the economic point of view is the economies of scale and the declining marginal cost

curves. The most important thing from a financing perspective is the ability of the utility to have monopoly power and to enforce payments for essential services. It is all the better if the utility has very low elasticity of substitution and hence low price elasticity.

There is, for example, a strong case to be made that when an activity is successfully carried on by private, profit-making entities, there may be need for public information and regulation to avoid price gouging and monopoly profits, but not for direct governmental administrative or financial involvement. Moreover, technology and the ability to unbundle services may alter the scope of what is and is not a monopoly service. For example, the U.S. income tax system depends heavily on private parties to “voluntarily” comply by preparing tax returns and remitting tax payments through the private banking system, as opposed to the “collectoria” that prevail in less-developed, cash-based economies. The deregulation of gas and electric utilities is rapidly demonopolizing the formerly vertically integrated generators and transmitters of power and transforming them into public utility carriers, allowing final users to purchase from competing suppliers.

We will return to the questions of how revenues should be raised according to benefits conferred, the demands of making projects “bankable” in terms of raising funds in the capital markets, and the revenue tools available to state and local governments. But next we turn to the issues of ownership and operation of the facilities.

Public-Private Partnerships in Ownership and Operation of Facilities

The question of self-supporting projects raises several related issues concerning the metes and bounds of public versus private ownership and operation and when and how the two may be blended into partnerships. If, in fact, a project can be self-supporting, why is it in the public sector at all? Most motor freight-related intermodal operations and infrastructure are in the private sector, although they clearly brush up against the public sector in the case of seaports and airport terminals. Part of the explanation is that, by its very nature, the trucking mode is highly mobile and far-flung, and the natural monopoly elements and agglomeration economics (and congestion costs) become vital considerations only for the site-specific points dictated by

ocean transit and airports. The guiding principle appears to be that only certain forms of transportation interconnections and certain vital locations warrant unique considerations in the area of intermodal.

The literature on public-private relationships is huge, yet there have been relatively few retrospective analyses of how specific deals have worked out for the respective partners (Kaplan 1996, 181). Generally, however, it is easier for the private than for the public partners to disengage from an unsuccessful project, since the latter partners are tied to a specific geographic point and have a more difficult (if not an impossible) time in defaulting or declaring bankruptcy. By and large, public partners have a longer time horizon, are more exposed to public scrutiny, are required to take a broader perspective, have deeper pockets (because of combined regulatory and taxing powers), and have more staying power (in large part because they are stuck where they are).

Planners have a great deal of latitude when it comes to teaming up public and private participants, but there are three basic models for public-private partnerships:

- **Build-operate-transfer (BOT)**—Under this approach, a private firm designs and constructs the facility with or without public-sector financing assistance. The private firm then assumes responsibility for operating and maintaining the facility for a period, usually 20 to 40 years, after which title is transferred to the host governmental jurisdiction. The costs of construction and operating are generally recovered through charges imposed on users. In this situation, the private developer, unless indemnified by the host government, accepts tort liability because private ownership is retained during the period of operation specified in the development agreement. Also, by private ownership it may be subject to taxes. (An example of this type of public-private partnership in the transportation area is the Dulles Greenway toll road project in Virginia.)

- **Build-transfer-operate (BTO)**—BTO differs from BOT in that when construction of the facility is complete, ownership of the project immediately passes to the public sector. The public jurisdiction then contracts with the private developer to operate the facility for a period specified in the development agreement. As with BOT, construction and maintenance costs are recovered through user charges. Major differences center on the issues of liability and taxes. Because the public

sector holds title to the facility, the developer is significantly more insulated from liability risk. (An example of this type of public-private partnership is the State Route 91 tolled high-occupancy-vehicle lane in California.)

- **Build-own-operate (BOO)**—Under this approach, a private firm or consortium operates and maintains the facility indefinitely because the development agreement contains no transfer provisions. The BOO model is related to the concept of a concession or a “perpetual franchise.” Design, construction, operation, and maintenance are private-sector responsibilities, with the public sector assuming only a regulatory role. (An example of a BOO project is the Ambassador Bridge in Michigan, which is owned by the Central Cartage Company.)

The Privatization Option

Total or partial privatization of a utility-type monopoly presents the challenge of combining market discipline with regulation. The issue is how to get the private (or public) monopolist to behave as if it were facing competition in terms of ensuring efficient operations. This leads to the complex issue of devising operating contracts that have performance measures and criteria and that tie compensation to achieving such standards. For example, contracts may call for multiperiod pricing caps that help enforce a reduction in costs. There may be periodic rebasing of the pricing that looks at effective rates of return and allows either credit going forward for excess profits (in the form of lower charges) or recovery going forward (in the form of higher prices).

There is no need for governments to own and operate everything that they have a vital interest in; objectives can be achieved by regulation and by astute contract writing. However, in the United States, extensive privatization of capital-intensive activities faces a significant obstacle. In most cases, state and local governments can finance facilities much more cheaply because of tax exemption and their ability to borrow large amounts for a very long term. Since the state and local activities are themselves exempt from taxation of various sorts, the workings of the tax code combine with access to capital markets to provide large hurdles for private companies wishing to own and finance facilities on their own. As a result, the operating contract configuration

under which private firms operate facilities owned by governments has been much more popular in the United States.⁷

When it was passed, ISTEA significantly increased the opportunities for involving private parties in transportation projects by authorizing greatly increased flexibility in blending federal aid with private financing and operating arrangements. The commingling of public and private funds and the sharing of responsibilities between the public and private sectors was meant to pave the way for significantly increased use of public-private partnerships as a development tool. Section 1012 of ISTEA (now codified as Section 129 of Title 23) expanded opportunities for federal-aid participation in toll roads and permits a wide range of public and private ownership of facilities constructed with federal financing. Section 129 also authorizes federal cost sharing in construction and reconstruction of toll roads. Nonetheless, public-private partnerships have not been widely used to date as a result of ISTEA. This is largely because of administrative, legal, and financial barriers, including federal tax regulations that make it difficult for governments to access the tax-exempt bond market.

TAXES AND TAX POLICY

Persistent, if not very successful, coalitions have sought to break down the barriers that obstruct or prohibit private firms from owning and operating public-use facilities. In the tax code these barriers have surrounded the use of tax-exempt obligations, and restrictions are found in private activity bonds, management contract, and change-in-use rules. The private activity restriction limits the extent of private (non-governmental) use to 10 percent and the payments on debt service

⁷ The "private activity" provisions in the federal tax code are very complicated and controversial, but the substance is that aside from some narrowly defined exceptions, it is uneconomic for governments to finance facilities that will be used for private business purposes. This tilts the cost considerations in favor of the state and local governments if they are willing and able to undertake the activity. On the other hand, many of the activities are meant to be self-supporting, and governments run into restrictions regarding their ability to undertake the activity and raise revenues in its support. The restrictions on private activity were greatly tightened in 1985 and have been only marginally relaxed subsequently despite repeated appeals by industry and state and local governments. The prevailing philosophy is that tax exemption will be reserved for essential public activities where the facilities financed are owned by the governments themselves.

from private sources to 10 percent. If both prongs of this test (or a couple of more esoteric standards) are met, the bonds cannot be sold on a tax exempt basis unless they belong to a special class of "exempt-activity" securities, to which certain transportation/intermodal issues belong. A related problem, which has been a stumbling block to certain deals, has been the provision disallowing tax exemption to any bond that has a federal guarantee. The change in use rules basically requires that any facility that has been in public ownership must retire any tax-exempt bonds outstanding if it is sold or transferred for private use.

Generally, those in favor of changes have argued that the percentage of private use and security in interest should be increased back to the old (pre-1985 Tax Act) standard of 25 percent, that the list of exempt facilities should be increased (to include toll roads, for example), that certain exempt facilities need not be publicly owned to qualify for tax exemption (such as terminals and docks), and that existing state volume caps on private activity bonds should be expanded or certain activities be exempted from them (McCormick 1996).

The proponents of lessened restraints on tax exemption won some limited victories in the new private activity regulations released in January 1997, which loosened the private management contract provisions, making long-term contracts with private parties more palatable (*Federal Register* 1997, 2275–2305).

On a larger scale, advocates of greater private involvement in public use facilities have for some time supported the creation of public benefit bonds that would be used for infrastructure projects and that would be tax exempt and free of the private activity restrictions and per-capita volume caps. One version calls for restriction of the sale of these bonds to individual and corporate retirement accounts [such as 401(k)] and the interest income on them remaining tax exempt when paid to the retirees. That idea was supported by the Presidential Infrastructure Investment Commission's report of 1992. In addition, the commission called for a national-level bank that would direct its efforts particularly at providing bridge financing and insurance against development and start-up risks for both public and private infrastructure projects. Such ideas date from the late 1980s but have antecedents in the 1960s. They have made no headway in the last decade as public concern about infrastructure has diminished.

ECONOMIC BENEFITS VERSUS FINANCIAL RETURNS

Whereas the rhetoric of presumed benefits to the public and private sectors is often important to gaining approval of a project in concept, actually putting a deal together tests the presumption of benefits against the painful fact that costs must be covered. It typically brings into bold relief the divergence between social and economic benefits and those revenue streams and assets that can be captured and pledged or otherwise mobilized to finance a deal.

In a purely privately financed project, the firm or investor is making a calculation as to the return of a project in terms of how it will affect the firm's overall profitability and equity value. The calculus to apply in the case of a publicly financed project is less clear in the absence of market-derived values for many of the asserted benefits and costs. Nonetheless, the two perspectives begin to merge when it comes to financing a project, since the capital markets will charge a market-determined cost of capital for a given level of risk it sees in a project, and it is up to the public or privately sponsored proponents to come up with the revenues to make those payments. This merger is even more complete when the project is intended to be in some significant way self-supporting and operated as an enterprise.⁸

An illustration of the difference between the public perspective on cost and benefits and the financial cost and revenues is found in the case of the Auburn intermodal project feasibility study done on behalf of the Federal Railroad Administration (Hickling Lewis Brod 1995). The Auburn truck-to-rail facility was financed largely through the use of federal CMAQ funds and had a start-up cost of \$2.9 million. It is intended to provide economies to paper companies along the dominant route to Chicago by shifting shipping from trucks to rail. In the Auburn benefit-cost study, benefits to be derived from the project were categorized into those flowing to users of the transportation system (divided between benefits to direct users of the facility and indirect benefits

⁸ The prime example is enterprise funds in the government sector, which use accounting principles that are essentially the same as those found in the private sector. The biggest practical distinctions are that public-sector equity is commonly held, is not fungible, and has no market value, and the entity is typically tax exempt.

flowing to transportation system users generally) and nonuser benefits (cost savings more generally shared by society resulting from a more efficient and environmentally friendly transportation system).

In the case of the Auburn facility, direct benefits assigned to the major shippers (paper companies) were truck operating cost savings, lower truck time costs, less insurance, and better damage control. In more built-up areas, such factors as local congestion reduction could be a large feature. Indirect user benefits were the result of moving to a less congested, safer mode. Safety costs are lowered, congestion for other drivers and truck wear are reduced, and time is saved. The indirect benefits may be important, but compensation for the improvements is difficult to measure, much less capture, on an individual basis.

The principal nontransportation user benefits were environmental improvements, although the study listed lower public costs for highway maintenance caused by less truck traffic as an indirect benefit. Not included in the calculations were efficiencies in the production process and lessened inventory needs.⁹

The analysis indicated a benefit in all categories, although the measurement of environmental benefits was seen as the major justification given the use of CMAQ funding. The mean net economic benefit expressed as a rate of return was calculated to be 87 percent overall, with the environmental benefits included, and 50 percent without those benefits. In the two respective benefit categories there was a 90 percent probability that the economic rate of return would exceed 60 percent and 36 percent (Hickling Lewis Brod 1995, 19).

Perhaps more to the point was the divergence between returns on investment shown in the cost-benefit economic analysis and the financial analysis. The Auburn intermodal facility could produce, given its projected revenues and costs (including debt service costs at a 10 percent rate of interest), an average financial rate of return of only 9.8 percent, and there was only a 90 percent probability that the return would exceed 5.3 percent. According to the analysis, that return was too low

⁹ Simply because an item cannot be quantified for a discrete case does not mean that it is unimportant. The just-in-time inventory phenomenon is a case in point. As major manufacturers rely on small inventories and quick delivery from suppliers, two things happen: (a) the economy runs more evenly since it is not as subject to inventory investment swings and (b) production becomes more dependent on the transportation system since, in case of disruptions, there is little inventory to fall back on. Intermodal facilities and operation are key to the low-inventory, just-in-time supply concept.

to justify any private interest in financing the facility. The analysis therefore concluded that the huge discrepancy between the expected financial return (low, but positive) and the economic return (extremely high to both users and nonusers) made the project a superb candidate for both government assistance and public-private cooperation (Hickling Lewis Brod 1995, vi). Without going into the details of the many underlying assumptions and their credibility, the Auburn analysis demonstrates the divergence between imputed economic values that may be enjoyed by various parties directly and indirectly benefiting from the project and the project's ability to capture part of those benefits by way of revenues sufficient to cover its operating and capital costs and to hedge against risk. It also raises the question of how projects might be configured to divvy up costs and risks and apportion them to the benefiting parties to the extent that they can be passed on.¹⁰

Unfortunately, but understandably, users are not anxious to have the benefits to nonusers reflected in their costs of operation, and nonusers are not eager to pay for what they do not directly use, even if they do accrue benefits. For example, the American Trucking Associations indicated in recent testimony a disbelief that tolls should be raised to cover imputed external costs such as noise pollution or that toll revenues should be used for nonhighway investments. But cross subsidies (such as automobiles typically pay in gasoline taxes to support the much more costly highway construction and maintenance that trucks demand) are not unknown to transportation: many major cities follow policies of keeping transit fares low to help relieve congestion, sometimes using bridge tolls and general taxes to defray public transit operating costs.

RISK, RETURN, AND HORIZON

Any investment and financing problem boils down to the issue of the trade-off between the hoped-for reward of future returns and the

¹⁰ The Federal Railroad Administration has a computer-based spreadsheet, RAILDEC, that is designed to quantify the public and private benefits of proposed projects and to suggest means for their financing. For example, projects offering high financial returns and low risk are prime candidates for private-sector financing. Those offering high economic return but low financial returns and high risk are likely to be purely public-sector projects. Those in between are targets for cooperative financing schemes. Besides Auburn, two intermodal projects, the Cincinnati Third Rail and the Pennsylvania Double-Stack are summarized (FRA 1996, Section 5).

risk that the investment will not pan out. Whereas such questions can become famously complex, the relevant comparison for the purpose of this paper is the risks and rewards of the private and public sectors in a large infrastructure or utility-type project. The two sectors need not and most likely will not have the same notion as to what are acceptable risks and hoped-for rewards. In large part this is because, whereas the private sector must capture its benefits in terms of increased profitability or enhancement of asset value, the public sector can be content to see its private sector benefit and derive its added "income" indirectly from enhanced incomes and property values. Furthermore, even in the case of a public enterprise, the demands are for self-sufficiency rather than for an accretion in asset value or surplus income.

Besides differing economic motivation, governments can control certain risks that the private sector cannot. Various permits and licenses are ultimately in the governments' sphere, and, directly or indirectly, governments may have the power to restrict markets, keep potential competition at bay, and focus their considerable resources and energies on making a particular venture succeed. Governments may also directly subsidize activities. And, although the restrictions are cumbersome, governments can typically finance at lower costs and on better terms in the bond markets or from commercial banks than can the private sector. Finally, the higher the level of the government (local, state, or federal) and the greater its geographic and economic scope, the greater its ability to capture benefits from the investment and regulate markets and would-be competing investments. All these elements have tended to make the governmental sector (or a regulated utility) the preferred party when technology and circumstances dictate a long investment horizon.¹¹

Firms contemplating investments have hurdle rates of return on equity that draw the line between what is a profitable investment and what is not. The cost of capital may vary among firms and industries, and for individual firms and candidate projects the cost of capital will be conditioned by the perceived risk. Generally, the more a firm can

¹¹ These are, of course, generalizations and abstract from the effect of the tax code, for example, on the private sector decision maker. Nonetheless, the sovereign has the overarching ability to control the legal framework, levy taxes, and regulate, powers that are denied the private sector. Furthermore, the federal government has the largest scope for spreading risks over sectors and through time.

leverage its equity and rely on borrowing, the lower its cost of capital will be. Moreover, the faster the company can see the return of its equity, the more profitable a project will be. Finally, larger, publicly held corporations are intent on seeing the value of their listed stock do well, which over the intermediate to longer run will be tied to their trend in profits. In summary, firms like rapid paybacks, like to leverage equity, and are risk averse. By the same token, they are not interested in either very high-risk or very low-return investments.

Governments, unlike firms, seldom make formal calculations of the return on capital invested. Most activities have ended up in the public sector because of a perceived private market "failure." That meant that the market-determined prices for or supply of a particular service did not reflect public benefits and that intervention in the form of public ownership or financing, or both, was required to ensure adequate and dependable production. Although the public service itself may not be priced, the resources used to produce it are, including capital. For example, most governments must borrow in the private capital markets, either in the bond market or from banks, and in those markets a counterpart to a calculation of perceived risks versus demanded reward is found in the various factors that go into the determination of credit quality on state and local government debt. The analogy to the private sector becomes most critical when the borrowing government is using self-supporting revenue debt that is secured by project earnings.

STATE AND LOCAL GOVERNMENT FINANCING TOOLS AND STRUCTURES

With regard to sources of revenue, the great divide is typically between general government (read, general public benefit) revenue sources and those relating to the provision of special services, such as utility user charges. However, the distinction is not ironclad, and taxes and charges can effectively reverse roles and parade as the other. Cases where special government units such as service districts or authorities are formed to provide a specialized set of services that are financed by facility users or occupants of the district are especially pertinent.

Since the focus of this paper is on the financing of projects, most of the discussion will concern sources of revenues that may act as a source

of funds either to service debt or further secure it in case an activity provides insufficient revenues. For that reason, the discussion deals first with the traditional and more specialized forms of tax revenues before turning to the subject of debt financing and credit enhancements.

General and Selective Taxes

The traditional source of funds for the public sector is the general tax levy. At the local level, this has amounted to reliance on the property tax and to a lesser extent the local sales (or gross receipts) tax. At the state level, the common taxes are the sales tax and the income tax. Whereas highway aid in particular has been financed by the local property tax, the use of selective and dedicated taxes that are related to highway use, such as motor fuel and vehicular taxes, has been much more important. Other modes of transportation have been supported by selective and dedicated tax programs, although the relationship of the taxes to transportation may be a bit of a stretch. Oregon has used lottery funds in part to fund highway improvements, and Ohio has used tourism taxes (levied on hotel bills and mixed drinks) to help fund port improvements. In the Northwest, the port districts have the power to levy property taxes. Even if the power is not used, it can work to secure the debt.¹² More generally, state economic development funds supported by general revenues can be a means of support when they are used to help fund intermodal projects.

Special Taxing and Assessment Districts

The concept of the special taxing or assessment district is to capture the benefits of particular improvements (or a matrix of improvements) and

¹² The device of having a standby taxing source is common for many types of self-supporting debt of an essential nature. The idea is that the first security (source of debt service payment) is the project's revenues. However, if the revenues are not sufficient, the investor can look to the tax levy as a secondary source. By the same token, state aid payments can be used as a secondary source (if there is a sufficient record of the aid program for an essential program). Where the facility proves to be self-supporting, the existence of the contingency debt is noted, but the debt typically is not counted against the legal debt limit of the jurisdiction. However, if the facility is not self-supporting, the debt is counted against the debt limit.

thus make them self-supporting to some degree. Whatever the particulars, the general idea is the same: cordoning off an area that benefits from an improvement and levying a tax or special assessment on affected properties to help pay for the improvement.

The concept has had some application in the transportation field and could help finance intermodal improvements. Such districts and the charges they use can come in many varieties, depending primarily on the elasticity of the governing state law and the imagination of the fiscal engineers. Special taxing districts have been used extensively among modes in the case of highways, where road districts have been used in developing areas in the state of Texas. Depending on the flexibility permitted under state statute and constitution, taxes and charges can be levied on all sorts of bases, including property value, front footage, and estimated trip generation of the land use. Examples of locally imposed street and road utility fees are given in the accompanying box. In some cases, such as the road district in Virginia, the special road taxes can be applied only to nonresidential property.

A special taxing district was used to finance the downtown terminal in the light rail system of Portland, Oregon. The charge system was designed as a gradient, whereby nearby properties paid a higher rate of tax than those farther away.

Special taxes or fees based on trip generation or some other proxy for actual usage have considerable advantages. All the users, such as local traffic generators, pay to support the local road system and do so in a way that is related to their demands on it. This contrasts with a property tax system, under which a percentage of traffic generators may pay nothing because of their tax-exempt status or property value may have little bearing on road use.

On the other hand, inequity can emerge with special taxes where usages are estimated and the estimates are necessarily based on averages for entire classes of property. Because of state statutory restrictions on taxation, fees must be carefully constructed to qualify as user fees and usually must be reasonably related to the use of public roads. An intermodal improvement area might be right under certain circumstances for the special taxing district, although that source would be likely to provide a limited source of revenues when it comes to larger projects.

Local Traffic Utility Fees

In 1992 Medford, Oregon, instituted a street utility fee based on estimated trip generation, the proceeds of which will cover road maintenance. There are 19 land use billing categories, including single family, multifamily, senior housing, and 16 nonresidential categories. Exemptions from billing include owners of undeveloped land and land that is developed but is without water service. Charges are added to the local utility bill. For example, a \$2 per month charge is issued to a single-family unit through a monthly utility bill. Medford maintains enforcement by the threat of shutting off utilities or bringing legal action for noncompliance.

Also in 1992 Port Orange, Florida, became the first city east of the Mississippi to adopt a traffic utility fee, which replaced the city's general taxes as a source of revenues. The fee was enacted, in part, because of city officials' frustration over the number of properties exempt from the property tax and not contributing to road maintenance. Port Orange's ordinance distinguishes among roads of different functions and allocates their costs separately, on the basis of trip generation rates. The ordinance classifies all residential and commercial land on the basis of the Institute of Transportation Engineers' trip generation manual. Adjustment procedures are in place that consider households without cars and average trip lengths generated by developed properties.

Types of Debt

Fundamental to the concept of credit is the source of funds used to repay the debt. In the case of bonds issued by public entities there are two broad classifications of debt: (a) tax-supported bonds and (b) revenue bonds.

Tax-Supported Bonds

There are several types of tax-supported bonds, including the following:

- General obligation bonds are backed by the full faith and credit of a state or local government and are usually the highest-rated debt of a state or locality.

- Lease revenue bonds or certificates of participation are backed by a state or locality's general credit but with no specific tax pledge, and debt service payments are subject to annual appropriation (they carry a lower rating than general obligation debt). They are often used to avoid debt limits and voter approval requirements.
- Special tax district bonds are paid from special charges added to property tax bills, and only beneficiaries pay the special assessment. An important subclass is tax increment bonds, which are paid from increases in property tax revenues in specified areas.
- Sales tax bonds (also called excise tax bonds) are paid from sales tax receipts.

Revenue Bonds

There is also variety among revenue bonds. The distinguishing feature is that they are paid from specific sources of revenue and are not backed by the general credit of the issuer. Most revenue bonds rely on some form of user fee or payments derived directly or indirectly from users. In the transportation area, the following are indicative categories:

- Highway user revenue bonds are paid from taxes and fees imposed on highway users.
- Toll facility revenue bonds are paid from toll revenues.
- Port authority bonds are paid for by users of the facility in the form of rental charges and fees.

Whereas the two classifications are handy in terms of recognizing a direct and fundamental pledge of funds to be used for repayment, the classifications frequently become blurred in practice because bonds may have a mixture of self-supporting charges and general or selective taxes earmarked for their repayment.

Risk and Credit Quality

All bonds are subject to credit analysis to determine their value. The estimation of risk versus reward can become exceedingly complicated, but there are certain fundamental considerations concerning their basic security (that is, the underlying strength of the promise to pay). For both tax-supported and revenue bonds the fundamental facets are as follows:

- Economic—demographics; tax base; nature of economy, employment, and output;
- Financial—revenue and expenditure structure and behavior;
- Debt—pledged security, repayment schedule, debt burden, and future capital needs; and
- Managerial/political—legal and political relationships and quality of management.

With tax-supported bonds, the focus is on the broader aspects of the sponsoring government and its financial position (as well as the base and behavior of the specific tax being pledged). With revenue bonds, the focus is on the ability of the project or activity financed to generate enough revenues to meet the cost of operations, unanticipated contingencies, and debt repayments. A revenue bond is particularly reliant on the provisions of a contract with the bondholders (the covenant) that require that the issuer behave in such ways as to protect the revenue stream, provide reserves, keep the facility in good repair, and not erode the lien position of the bondholder.

Four key provisions attract special scrutiny:

- The rate covenant is a legal pledge to set rates and charges at levels sufficient to cover operating costs and reserves and to meet a minimum level of debt service coverage.
- A debt service reserve is required to meet any temporary disruptions in revenue flow; other reserves for repair and replacement are usually required.
- The additional bond test is a restriction on the conditions under which additional debt may be issued.
- The lien position is an agreement as to the priority of the payment of debt service on a particular debt among the various other payments that are to be made. Bonds that come first among the obligations are called senior lien bonds; bonds that come after other debt is paid are called junior lien bonds.

The nature of the lien position and the parity of payments can be essential in determining credit quality. Although most private lenders are interested in having a first call on revenues, some are willing to take debt of a junior ranking and receive a higher yield. As will be discussed,

lien structure can be combined with the notion of standby credit to provide a powerful form of credit assistance to major public-private projects.

Credit Enhancements

Credit enhancements are third parties (in addition to the two primary parties of the borrower and the lender) who guarantee or otherwise lend assurance that debt service will be paid in full and on time. Five forms of enhancement are common in the municipal bond market:

- Bond insurance is a noncancelable guarantee that debt service will be paid issued by a private insurance company, which charges a premium.
- Letters of credit, which are normally issued by a commercial bank, are irrevocable agreements to pay on demand the amounts needed to meet debt service in case the issuer cannot do so. These arrangements amount to the bank agreeing to make a future loan to the issuer if it is needed. A variation is the standby line of credit under which a loan will be made on demand to the borrower, if certain conditions are met.
- Under a direct guarantee, one jurisdiction “stands behind” the debt of another, as in the case of a state guaranteeing school bonds. Debt that is guaranteed takes the same rating as the guarantor, but the obligation is a contingent liability and counts against the indebtedness of the guarantor.
- The moral obligation or appropriation bond is a cut below the full guarantee. In case the borrower has trouble, the enhancer will automatically “consider” making an appropriation sufficient to pay a shortfall in debt service. By the same token, the obligation is not seen as a binding liability of the enhancer.
- Under state aid intercept programs, future state aid receipts are pledged by the borrower. In case of an actual or pending shortfall in debt service, the funds are sent to bondholders.

In the case of bond insurance, the letter of credit, or the direct guarantee, the credit rating of the enhancing party is conferred on the enhanced borrower. Under the last two enhancements, the credit quality of the enhanced obligation is conditional on the rating of the enhancing party and the nature of and experience with the particular program.

All the enhancement devices are potentially important to intermodal projects, but lines and letters of credit are receiving increasing attention because they provide a way to “pledge” the availability of future loans or grant receipts to back up a project without making an immediate cash outlay. By the same token, the ability to intercept aid, while in its infancy in the transportation area, is another potentially important device in view of the widespread use and perennial nature of state highway aid.

State Aid Pledges and Intercepts

State aid is typically an important aspect of local or regional transportation financing. Not only is the aid itself a potential source of construction funds, but the promise or prospect of future aid payments that are pledged to repay bonds can be an important lever in securing bond issues.

State aid pledges and aid intercept programs are increasingly popular. The programs use state aid entitlements as a form of assurance (but not direct state guarantee) that debt service obligations will be met. The programs may operate in one of two basic ways: reactively or proactively. In the first, in the event of a potential default, states may withhold aid to localities whose aid payments have been pledged and pay the debt service. In the proactive stance, a state may directly set aside the required debt service funds to provide for a local unit’s debt repayment.

State aid intercept programs have been used most often to enhance the debt of school systems. Thirteen states have some form of state aid withholding programs for local schools. However, the idea is catching on in the transportation area. Maryland, Virginia, Michigan, Florida, and California are among the states that allow localities to issue bonds secured by local shares of state-distributed highway aid.

State highway user revenues distributed to localities could be used to secure bond issues (see the accompanying box) from future state-aid-generated revenues. Infrastructure bank loans secured by repayments from state aid could be structured with more attractive loan terms (e.g., long interest-only periods, increasing debt service) than publicly sold tax-exempt bonds. Intermodal projects could use state aid intercepts to lower debt service costs (via the higher bond rating) and increase market acceptance of their bonds. The intercept programs are virtually free of cost for the state governments that administer them. Program costs

paid by local borrowers are typically minimal. However, to receive a minimum rating on state debt support programs, specific state legislation is typically needed to establish the program.

Short-Term Borrowing and Standby Credit

Historically, short-term borrowing has been used to accelerate construction projects. Grants, including federal highway aid, may be received as reimbursement for costs incurred on eligible projects. By issuing notes,

State Aid Intercept Program, Maryland Department of Transportation

The ratings on the state's transportation bonds were as follows as of October 1997: Moody's Investors' Service, Aa; Standard and Poor's, AA; and Fitch, AA. These ratings are uniformly "one notch" below the state of Maryland general obligation bond rating of Aaa, AAA, and AAA assigned by the respective agencies.

Proceeds of bond issues are used to fund various transportation facilities with the participating counties. The debt service on the bonds is paid from amounts deposited into a sinking fund maintained by the state comptroller. By agreement among the state department of transportation and participating counties, the state comptroller withholds from highway user revenues allocated to each county an amount equal to each county's share of debt service in the current and the next fiscal year. Each county also covenants to keep its pledged share of highway user revenues free of conflicting commitments.

The bonds are not direct obligations of the state but are technically obligations of the participating counties (and Baltimore City). But the revenue collection and payment mechanism are state controlled. The state department of transportation will not issue bonds on behalf of a participating county if that county's share of highway user revenues for the latest fiscal year is less than twice its maximum annual debt service on bonds secured by highway user revenues.

funds are available sooner to begin construction. The note proceeds are spent on construction, and as aid is subsequently received, it is used for reimbursement. Alternatively, short-term notes may be refinanced by the sale of bonds. Either project revenues or future aid funds are then used to pay debt service on the bonds. Borrowings where there is an explicit pledge of future federal aid payments were prohibited to be issued on a tax-exempt basis by the federal Tax Reform Act of 1986. Federally backed notes may be issued on a taxable basis (i.e., bearing higher interest rates), but few public entities have chosen to use this financing mechanism. There are ways to get around this restriction.¹³ The existence of standby federal loans offers the opportunity for a pledge not of future grant payments as a takeout, but rather for the possibility of a loan should the need arise. In other words, investors could lend short term with the assurance that even if the issuer cannot access the tax-exempt bond market, they can be taken out by recourse to the standby loan agreement.

Overall, the two Orange County toll roads discussed in the accompanying box were able to get the backing of two standby lines of credit that cost a total of \$17.6 million in budget authority and provided \$240 million in backup credit, which in turn leveraged \$2.7 billion in borrowing from the private capital market. In all, the federal and state financing shares added up to less than 5 percent of the costs (Kreutzen 1996, 5). Care had to be taken that the backup line of credit was not considered a federal guarantee, a barrier that was surmounted by having it keyed to ridership levels as opposed to any shortfall in debt service payments on the senior debt.¹⁴

¹³ A form of tax-exempt grant anticipation note (GAN), similar in concept to Section 9 transit financings, is a potential financing option for public entities such as state departments of transportation. Whereas the notes would be issued to finance construction, the obligation to repay the notes could be structured as a general obligation of the issuer. By pledging all legally available funds to repayment of the notes, the direct connection between the notes and future grant receipts is avoided, even though grant funds may ultimately be the actual source of repayment. But, since federal grant funding is subject to both authorization and appropriation, there is no guarantee that grant funds will ultimately be received. Therefore, entities issuing GANs must be able to demonstrate that even if no future federal grant funds are received, alternative sources will be adequate to make debt service payments.

¹⁴ Of course, it may be argued that the whole exercise, by permitting access to the tax-exempt securities market, represents a clever circumvention of restrictions on the use of that "tax loophole" and thus fosters inefficiency in the allocation of resources. That assessment appears harsh in view of the variety of projects, including those involving public-private cooperation, that are able to finance on a tax-exempt basis. Why should state and local participation in this particular venue be disadvantaged compared with other purposes?

Lines of Credit to California Local Transportation Corridor Agencies

The 1987 Federal Surface Transportation and Uniform Relocation Assistance Act designated the toll road system in Orange County (San Joaquin Hills and Foothill/Eastern Transportation Corridor Agencies) as one of a limited number of toll facilities eligible to receive federal funding. Under the 1993 DOT appropriations act, the Secretary of Transportation was authorized to enter into an agreement to make loans to the San Joaquin Transportation Corridor Agency in an aggregate amount of up to \$120 million.

In the San Joaquin Hills case, loans of up to that amount are available to the extent that revenues from toll operations and standard reserves are insufficient to make debt service payments on debt issued to finance the project. Not more than \$24 million in new loans is available in any one year. Loans are available upon completion of construction and until 5 years after the date through which capitalized interest on the bonds is available. Amounts drawn under the federal line of credit will bear interest at the 30-year U.S. Treasury bond rate and must be repaid within 30 years. The Foothill/Eastern letter of credit is structured somewhat differently. In both cases, the existence of the letter of credit, while a complicating factor, has not blocked the issuance of tax-exempt debt.

Availability of the federal standby line of credit is triggered by ridership shortfalls. It can be drawn upon if ridership falls below expectations and can be used to meet interest or principal on the bonds or other required payments. The line of credit, if used, must be paid back at a nonsubsidized rate once the traffic builds to sufficient levels. This provides protection during the ramp-up period and was essential for marketing the bonds. Advocates argue that the federal government can afford to take the long view and should be the flexible long-term lender. A default on the basis of a rider projection error would badly damage private financing of toll roads. As is discussed later, private capital markets cannot take ridership risk on a start-up toll facility. Federal lines of credit have required specific legislation for the two Orange County

roads. What is interesting is the form of the credit assistance and how it was meant to sew together transactions that were financed by some combination of public and public-private funds.¹⁵

The October 1993 \$1.2 billion issue for San Joaquin Hills (interest rate of 7.6 percent) was the initial foray using the federal standby line of credit for a transportation project. The unfamiliar bonds were rated only by Fitch Investor Services and then at the most marginal of investment grades, BBB-. Since 1993, nearly \$4 billion of start-up toll facilities have been financed either in the bond markets or by direct placement: \$1.5 billion for the Foothills, \$1.2 billion for San Joaquin, \$630 million for E-470, \$250 million for Dulles, and \$200 million for SR-91. None of these toll systems used ISTEA provisions to access federal funds.

Patient Money and Junior Liens

Governments can help infrastructure projects by providing “patient” subordinated capital. The interest cost of this capital is typically much less important than the timing and nature of the repayment structure. Ideally, the structure is such that if the project is successful, the debt can be restructured and refinanced. The junior lien is important because it means that the operating costs and other (senior lien) debt are paid off before the subordinated debt.

There are several advantages of this type of loan structure if the public truly has a vital interest in the project to be financed. First, by taking the junior lien, the senior lien can be of higher credit quality and enjoy higher coverage (see the discussion in the accompanying box). That translates into lower interest cost and faster repayment of the private-sector debt. Second, the classic arguments for a public involvement are that (*a*) there is a large component of public good benefit that is dispersed over the region or nation that cannot be economically captured, (*b*) there is high uncertainty of usage in the early years but risk diminishes as time goes by, (*c*) the longevity of the economic life means that the project may be overbuilt but it is a long-term benefit to have early excess capacity, and (*d*) the scale of the project is too large and complicated for the private sector to absorb all the risk.

¹⁵ It has been argued that these lines of credit leverage federal budget outlays nearly 15 times (Rich 1996).

The junior lien position on long-term debt does a good financing job of meeting and mitigating these problems. For example, in the case of large, complicated facilities with many public and private players, just getting the parties aligned and working together is difficult and time-consuming. If the public shows up with a big chunk of patient, junior debt, the numbers start to work. The private sector either takes up the equity or the short-term, higher-quality debt and charges less for the cost of capital. A prime example of the use of the subordinated loan to make a project feasible is the Alameda Corridor, which reflects an impressive patchwork of grants and loans from all three levels of government, as well as an innovative user fee system based on corridor and port use. The federal participation was made possible by special demonstration project funding under the Highway Act of 1995.

The Alameda Corridor is the most celebrated and costly intermodal freight project. The project is of national significance since the two ports involved, Los Angeles and Long Beach, together account for 25 percent of all international trade that enters the United States by sea. The corridor project involves the largest concentration of intermodal traffic in the nation, with 20,000 truck trips and 29 train trips per day already and a shipping volume that is growing at 7 percent per year. The project, which is slated to cost \$1.8 billion in public funds, consists of consolidating 144 km (90 mi) of track owned by three railroads into one 29-km (18-mi) corridor of track, complete with trenching and grade separations to ease traffic congestion, restore blighted areas, and speed freight hauling. Not stopping at the Los Angeles Distribution Center, the MPO planners are already at work on a second phase that will combine track out to San Bernardino in an effort to further relieve congestion and speed traffic (GAO 1996a, 8).

The Alameda Corridor has its imitators in the wings. A group of rail lines and shippers in Southern Louisiana is pushing for a similar corridor between Baton Rouge and New Orleans. The project would entail 193 km (120 mi) of track as opposed to the 32-km (20-mi) corridor in Alameda (Plume 1995, 40).

Revolving Funds

As noted, SIBs were envisaged under ISTEA and are struggling to get off the ground with the NEXTEA legislation. They are meant to open

Alameda Corridor Loan

Central to the financing of the \$1.2 billion project is a \$400 million federal loan that will sit underneath the project's prime mover, a \$712 million revenue bond. The project bond will be secured on payments of port wharfage fees (paid by shipping lines to the ports) and rail corridor use fees (based on containers and railcars). In addition, the project is scheduled to receive \$868 million in grants.

The \$400 million DOT loan is a good example of a subordinated loan. The proceeds of the loan can be used for practically any project expenditure and can be taken down when needed. In the loan agreement, the government took a junior lien on repayment to all operating costs, any other indebtedness (provided such indebtedness shall not exceed \$1 billion), and contributions to the renewal and replacement fund. Furthermore, it generally subordinated itself to any definitions that might be used in the ultimate trust agreement for the project bonds. Interest may be capitalized through 2005, if necessary, and interest rates were keyed to the 10-year and 30-year U.S. Treasury bond rates prevailing in January 1997. A failure to make payment because of insufficient project revenues will not constitute a default if the project revenues bonds are outstanding; payment shall be simply rolled forward to the next due date. In other words, DOT is taking the risk of project revenues. Furthermore, the issuer may sell bonds at any time to retire the debt without penalty. If the project terminates without completion and sale of the project bonds, the issuer has until 2021 to repay the balance in equal debt service installments.

This loan structure acts as an enhancement for intermediate and long-term financing, allowing the Alameda project to draw down the \$400 million as needed. The standby availability allows the ports to finance at lower short-term rates with assurance to the lenders that the DOT loan can be tapped if necessary to pay them off.

an important new source of transportation infrastructure financing by recycling, as grant money is used for capitalization and the funds subsequently raised and repaid are “washed off” in terms of federal restrictions. The basic idea is not new, although the motivation is different from that behind the two water-related programs.

The state revolving fund (SRF) program mandated under the 1985 amendments to the Clean Water Act was meant to wean municipalities from the massive Environmental Protection Agency (EPA) public wastewater treatment construction grants program. It mandated that states set up revolving loan funds to help localities pay for future improvements. Since, in many cases, the localities were operating under environmental mandates and regional offices have latitude in forcing cleanups, the speed with which the loans went out or the federal funds have been leveraged by state borrowings has varied considerably. Nonetheless, the program has been seen as successful overall in switching from grants to loans (many of which are deeply subsidized) to finance sewer treatment facilities.

The recently announced federal safe drinking water supply revolving loan program extends the idea of the SRF into drinking water treatment. The costs of water supply are destined to rise sharply as federal water standards begin to take hold, although the degree of severity depends on how vigorously the federal drinking water standards are enforced.

There are examples of revolving loan funds at the state level that might be of interest to intermodal projects, although none has the size or experience to be of help in large projects. Rail freight revolving loan programs exist in Illinois and Nebraska, but they were established to aid local rail service lines threatened with closure. The state of Florida uses a revolving fund to assist in toll road construction by its local governments. However, the transportation area has yet to see much application of the idea.

Whereas 10 states are participating in the SIB pilot program, each has been limited to an initial \$10 million capitalization from federal grants. So far, none has financed a project.

INTERSTATE AND INTERREGIONAL COMPETITION

The existence of interstate or interregional economic competition raises difficult issues when it comes to an intermodal project's financ-

ing. Geographic competition may erode the monopoly position of a government or a private-sector franchisee and increase the risk of a particular facility. This can be a major impediment to any investment but especially to those where it is hoped that private capital will be deployed. The competition is intense and promises to become more so. In candor, the author believes that there are few nationally significant intermodal projects. Intermodalism is important to encourage, and projects should not be allowed to fence off competing modes as was once done when motor freight and railroads competed for long-haul business (and as is still the case for rail and barge). But that is more of a regulatory issue than a driving concern. The most compelling arguments for federal involvement in intermodal facilities concern facilities vital to international trade and commerce, where the role of the federal government is historic and constitutional. Thus, where there is a heavy element of international trade, there is a *prima facie* case for national concern. But, by the same token, the evolution of the transportation business has been toward intermodalism, and that development has consequences for major inland railheads in particular.

The availability of a federal subsidy may encourage overbidding as communities compete for commerce and jobs. Some experts worry that subsidies only add fuel to the fire of competition that is perhaps best left to market forces to resolve. A case in point is the furious competition in building port capacity, of which there is too much of the wrong or outmoded type. According to some observers, the logic of transportation is driving to greater concentration—fewer and larger major terminals. Thus, the scatteration of improvements is only exacerbating the ultimate weeding out process.¹⁶

Meanwhile, the competition among ports on the East Coast is evidenced by the price cutting in which they are indulging to attract traffic. The problems appear especially acute for the smaller ports, such as Boston and Philadelphia, that are being bypassed in favor of larger

¹⁶ See comments by Tom Dowd, James Brennan, and others (Burke 1996, 31). For example, combined public and private funds going into modernization of Boston harbor will sum to \$400 million to \$500 million, nearly \$200 million being directed toward double-stack container improvements. Given the advantages of the ports of Halifax to the north and New York to the south, the benefits of the Boston Harbor improvements are likely to be fairly local. But the belief is that double-stacking improvements are needed just for the port to stay alive.

ports. The shipping alliances are fielding progressively larger vessels that put pressure on small port facilities and cause expensive delays. Overall, the Asian-based traffic of West Coast ports has grown rapidly, whereas that of the East Coast continues to flag. The rate cutting is an economic stimulus measure: the ports are important to the economies of the older eastern cities. In New York and New Jersey, for example, the ports are responsible for 165,000 jobs and annual wages of \$6.3 billion (Mathews 1997, A2).

The plight of some of the second-tier ports is compounded by the fact that they may be reliant on one primary shipper or rail carrier, which as a monopsonist has considerable bargaining strength. For example, CSX Corporation has placed pressure on the state of Maryland to increase rail line capacity, holding improvements to the Port of Baltimore and the state-supported commuter rail system as hostages. CSX wants the state to chip in large amounts of state and federal aid. The problem is acute where rail line capacity is demanded both by freight and passenger traffic, the latter of which is of little interest to the railroad companies and the demands of which are often incompatible with the slower, through freight traffic. Negotiating for added track space can be heated and occasionally ugly.¹⁷ But CSX holds a strong position in that it is the dominant carrier to the Port of Baltimore, and CSX wants the port to increase its capacity to haul double-stack trains. CSX says that because of commuter traffic it cannot come up with the money to make the needed improvements to rebuild tunnels and make other double-stack improvements, a project CSX is unwilling to undertake with its present track situation. Evidently, the price of CSX cooperation is having the state of Maryland petition the federal government for funds to add a third track (Phillips 1996, C-1).

Competition is equally intense among the newer ports on the West Coast, and enhanced rail service is also at the heart of much of the jockeying for position. The Ports of Seattle and Tacoma are completing a deal with the Burlington Northern Santa Fe Railroad to resurrect a previously abandoned major freight link across the state of Washington that will relieve congestion and expand capacity to support increased freight movements through the ports. The added tracks are badly

¹⁷ Among the hostages taken have been Oriole baseball fans, whose special rail service to Camden Yards baseball stadium was canceled when negotiations bogged down.

needed to meet the needs of Seattle-Tacoma, which is the second-largest container port in the United States after Los Angeles-Long Beach. Seattle-Tacoma is making huge investments in new docks and terminals, but its competitive position and, hence, investment are exposed unless transcontinental rail service is improved. The SeaTac ports now handle some \$55 billion in international commerce per year, and the new route over the Cascade Mountains could carry up to \$25 billion per year in traffic (Machalaba 1996, A6).

Whereas competition among many users of, and locations for, intermodal facilities may be the norm, the railroads, a major user group, are undergoing a merger movement of heroic proportions that is leading to a high level of concentration. There is both good and bad news in this development. Rail traffic has increased by leaps and bounds—by 50 percent in the last decade. Shipping costs have fallen (the average cost of shipping by rail dropped by 62 percent between 1986 and 1992). However, the agglomeration and cutbacks have led to severe operating problems on some routes, such as the highly publicized problems of the Union Pacific, which recently bought the sprawling Southern Pacific. Overall, the largest four railroads now control more than 90 percent of ton miles of rail traffic, up from less than 70 percent only 2 years ago (Longman 1997, 52). Most rail-dependent shippers and their localities are truly captive customers with only one rail provider. That situation leaves the railroads in the position of deciding on the economic fate of firms and communities.

ECONOMIC DEVELOPMENT AND FINANCING FLEXIBILITY

Not all the concerns for economic development are quartered on the coasts. A few inland intermodal projects have displayed innovative skills in thatching together funding sources. One of the few examples of the eclectic approach to financing is found in the Stark County intermodal facilities (see the accompanying box). Orchestrated by the Ohio Department of Transportation (ODOT), the project was financed by a combination of sources, using ISTEA's CMAQ funds to provide a critical ingredient. Federal funding of the Stark County Intermodal Facility is distinguished by three factors: (a) determination that the

Stark County Intermodal: A Patchwork of Funding Sources

In the Stark County Intermodal Facility project, ODOT intended that financing be in the form of a loan rather than a grant. Using ISTEA's Section 1012 loan provisions and the flexibility afforded by the TE-045 process, ODOT lent \$11.2 million of CMAQ funds to the local agency for 100 percent of total construction costs of the intermodal facility. To fund the CMAQ loan, ODOT used a combination of Stark County's share of allocated CMAQ funds and CMAQ funds allocated by the state of Ohio. Because Stark County's land contribution was too cumbersome and time-consuming to determine for purposes of satisfying the 20 percent nonfederal matching requirement, toll revenue credits from tolls generated by the Ohio Turnpike Authority, under provisions of Section 1044 of ISTEA, were credited to the project. Essentially, that allowed the federal share to cover 100 percent of the \$11.2 million project cost.

In addition, Wheeling and Lake Erie Railway covered the \$1.9 million cost of relocating its rail track to accommodate a private firm's expansion. In expanding, the firm invested \$24 million of its own funds to construct a new distribution center next to the intermodal facility. The economic development argument was key in lacing the deal together. This firm's expansion will ensure retention of 450 jobs at the site, and the facility will create 180 new jobs. It is hoped that the facility will encourage another 500 jobs through construction of new warehouses and facilities in the area, although that is not assured. The project will be operated by a private firm that will charge approximately \$50 for each container lift. After a start-up period, it is hoped that operations will generate \$10 in net revenues to be divided among the participating state and local government parties. The company operating the facility will carry any operating losses on a loss carry-forward basis to be repaid, with interest, before any payment is made to the public parties, including repayment of the ODOT loan.

project was CMAQ-eligible; (b) a liberalized interpretation of ISTEA's Title 23, Section 129, which permitted the CMAQ funds to be provided as a loan rather than a grant; and (c) creation of a revolving loan fund from loan repayments.

The Stark County Intermodal Facility qualified for CMAQ funding because operation of the terminal would reduce vehicle miles traveled on the state's highway system in a number of nonattainment areas and thus relieve air pollution. When a loan of CMAQ funds to the Stark County Intermodal Facility was first proposed, the then federal law¹⁸ strictly prescribed the terms of loans made from federal ISTEA funds pursuant to Section 129 of Title 3. Using FHWA's innovative research (TE-045) program's flexibility, the parties were able to structure more flexible loan provisions, set forth in an agreement between the two parties, to meet specific needs of the project. This involved considering the terminal charges as tolls.

The CMAQ loan is unique in that it uses the project's anticipated net revenues (the terminal's gross receipts minus operating, administrative, and maintenance expenses) as the source of repayment for the loan. Under the original ISTEA legislation, Section 129 loans were permitted only for toll road projects with repayment of loans from toll revenues. A broader interpretation allowed a CMAQ loan to be made for this type of revenue-generating project. In addition, the CMAQ "loan" made for the Stark County Intermodal Facility is not a loan in strict terms, but rather an "advance" in that there is no fixed repayment schedule and interest will not be charged. FHWA's TE-045 process facilitated receiving approval to use loan repayments to create a revolving loan fund for financing other future transportation projects. Although state statutory authority to create a revolving fund existed, federal authority was less clear. Permission was received to create a revolving fund from ODOT's portion of loan repayments. According to the project agreements, net toll charges from the Stark County Intermodal Facility project to the Stark County Development Board are split into three equal portions.

¹⁸ The Stark County Intermodal Facility was approved as a TE-045 project before passage of the National Highway System Designation Act of 1995. Many of the financing innovations pioneered under TE-045 are now widely available for use outside the TE-045 program as a result of this act. The National Highway System Designation Act has eliminated the prescribed loan terms originally required of Section 129 loans.

Whereas the Stark County intermodal financing was both creative and successful in building the facility, the project itself has evidently had an uncertain start. The major problem appears to be the facility's access to the EDI, the electronic network that is vital for transshipping and tracking freight. Although the Stark County Development Board thought it had acquired rights to access the network, that proved not to be the case, and, as a result, usage of the facility is running below expectations.

RELIABILITY OF ECONOMIC AND FINANCIAL PROJECTIONS

One of the hopes for major infrastructure projects that are to be undertaken by the public or the private sector or by a public-private combination is that they will be self-supporting to a significant degree. This depends both on the effective demand for the facility and the ability of the project sponsor or operator to tap that demand in the form of the necessary revenues to support operations and pay the cost of capital, be it debt or returns to ownership.

As was noted, the ability of governments or franchised utilities to capture payments in the provision of basic services over which they effectively have monopoly powers has been demonstrated. However, where there are geographic or technological substitutes or where economic growth does not live up to expectations, there can be problems. The high level of risk and the inability of private-sector sources to run long-term deficits and to "control" markets cause a major impediment to greater use of user charges and toll facilities.

The results of recent toll road financings that involved essentially start-up operations have been disappointing in the short run because projected volumes of usership have not been forthcoming. In a recent review of toll road projection results, analysts at J.P. Morgan found that of 14 toll road projects studied, only 3 met or exceeded revenue projections used when the bonds were sold (J.P. Morgan Securities 1996). Whereas 1 of the remaining 11 projects was only 12 percent below forecasts, the remaining 10 were from 20 to 75 percent below projections by the fourth year, and most of these 10 missed their revenue projections by 40 percent during the second year of operation. Because the prepon-

derance of these projects were in the public sector and were essentially additions to established systems, there were no bond defaults.

What's wrong with the forecasts? They were too optimistic about national and local economic conditions and rates of development in the corridor being served, the ability to achieve higher levels of tolls than were customary, and the effect of the availability of alternative routes. In particular, greenfield projects without established commuting patterns by commuters who place a high value on their time are high risk. Where there is an assumption of rapid revenue growth, there is a greater possibility of trouble. The greater the degree of congestion in the corridor to be served and the higher the income level and economic activity already in place, and the more modest the assumptions about revenue growth, the better the prospect that toll roads will meet their expectations.

The experience indicates that user charge studies need to be heavily discounted when it comes to revenue expectations. Furthermore, projects that already have heavy use, where congestion costs are considerable and recognized, and where there are no reasonable close substitutes (and the governmental units involved are committed to retaining "monopoly-like" controls to head off any competition) are by far the best candidates for private market solutions. Virgin projects that will need to grow by displacing existing traffic and intermodal centers are much riskier propositions.

CAMINO REAL INTERMODAL CENTER

The Camino Real Intermodal Center (CRIC) project will be a state-of-the-art border-crossing facility located on the border between New Mexico and Mexico at the international port of entry of Santa Teresa/San Jeronimo. The site is approximately 11 km (7 mi) west of El Paso, Texas, near the crossroads of two U.S. Interstate highways and three¹⁹ major railroad operations and facilities. The proposed intermodal facility will alleviate the overflow of commercial traffic currently passing through El Paso, allowing truck, rail, and air shippers to store and move cargo between the United States and Mexico more efficiently and cost-effectively. By creating greater reliability for goods movement

¹⁹ Railroad mergers have reduced from five to three the number of companies serving the area: Burlington Northern/Santa Fe, Union Pacific/Southern Pacific, and Ferrocarriles Nacionales de Mexico.

and timely deliveries, the CRIC project is expected to induce additional economic development and enhance trade. It will also provide safer passage of hazardous materials, which currently move through the very congested Ciudad Juarez and El Paso areas. By helping to reduce congestion, the CRIC project should also improve air quality in the El Paso area, a severe nonattainment zone by EPA standards.

The intermodal facility portion of the CRIC project is expected to cost approximately \$60 million, including land, trackage, yards, buildings, and associated equipment. Preconstruction development costs of \$6 million, together with financing and other "soft" costs, are expected to result in a total cost for the intermodal facility itself of approximately \$80 million. In addition to the intermodal facility, costs will be incurred for new roads that will provide better access to the center and that are expected to relieve much congestion in the urbanized area.

The plan for financing CRIC assumes that the project will be self-supporting, privately operated, and capable of obtaining conventional private financing after an initial development period. Operating and capital costs will be paid from revenues derived from a variety of fees and charges collected from users of the facility. However, to obtain permanent financing, approximately \$6 million is expected to be spent on preconstruction costs, including an environmental impact statement, engineering studies, and a financial feasibility study. CRIC, Inc., a special-purpose corporation that has been set up to oversee the project, is arranging a bridge loan from a commercial bank to cover these on the front end. It is anticipated that the loan will be repaid with the proceeds of conventional private project financing. To improve the prospects of obtaining private financing for the preconstruction loan, CRIC, Inc., proposed to secure the loan with a guarantee from the New Mexico State Highway and Transportation Department (NMHTD), backed by up to \$6 million of New Mexico's future regular federal-aid apportionments.

To bolster the prospects for obtaining a private preconstruction loan, CRIC, Inc., plans to further secure its bank loan with a guarantee from NMHTD. The state has agreed to pledge up to \$6 million of New Mexico's future regular federal-aid highway apportionments as a repayment source in the event permanent financing is not obtained. For such a pledge to be made, however, the project's eligibility for federal financial assistance had to be established. In December 1996 it was determined that the highway connections and assorted other costs of the project were eligible for \$6 million and that a federal loan guarantee for that amount could be used.

To provide the loan guarantee, the federal aid would take the form of a contingent Section 129 loan from the department to CRIC, Inc., funded pursuant to advance construction.²⁰ NMHTD will use its existing authority to provide the loan guarantee.

Although FHWA has assisted in structuring the federal assistance, FHWA will not be a party to any direct agreements with CRIC, Inc., or NMHTD. The accompanying box with its diagrams indicates key aspects of the loan guarantee structure.

In March 1997, FHWA and NMHTD had approved an advance construction Section 129 loan for the CRIC project. However, final execution of the loan agreement is contingent upon CRIC, Inc., securing a bank loan for the actual funds to pay preconstruction costs. It is expected that the bank loan and the Section 129 loan agreement will be entered into simultaneously in the near future.

To approve the contingent Section 129 loan, eligibility for structuring the federal aid as a Section 129 loan had to be established. Establishing eligibility for a Section 129 loan requires identifying a “dedicated revenue stream” for repayment of the loan. FHWA concluded that anticipated permanent financing of approximately \$80 million constituted a “dedicated revenue stream.” In addition, the value of dedicated right-of-way and ongoing future revenues could also be considered as dedicated revenue sources.

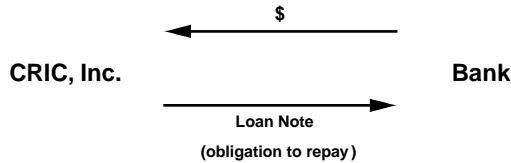
Like a true standby, the Section 129 loan will be made by New Mexico only if other sources for repaying the bank loan are not available. The state’s loan is intended to be repaid from proceeds of permanent financing arranged at some future date or from other revenues yet to be identified. The financing risk the state department faces is that if the project does not go forward, there will be no permanent financing and no other readily available means to repay the federal Section 129 loan.²¹

²⁰ Federal law does not explicitly provide for using federal-aid highway funds to make loan guarantees. Technically, federal financing assistance for the CRIC project is being structured as a loan (under Section 129) that may be used to pay off another loan (the bank loan). Reflecting the effective nature of this arrangement, this case study refers to the federal assistance as a loan guarantee.

²¹ To reduce the department’s financial exposure and to have CRIC, Inc., share in the risk that the project will not be completed, a condition for the Section 129 loan is that CRIC, Inc., concurrently provide a \$3 million irrevocable letter of credit from a commercial bank that NMHTD could draw upon in the event the department’s guarantee is called upon. The letter of credit effectively creates between NMHTD and CRIC, Inc., a 50/50 sharing of the risk of project noncompletion. As of March 1997, CRIC, Inc., had obtained commitments from two banks to provide the letter of credit. CRIC, Inc., has also pledged its corporate assets to repayment of any Section 129 loan.

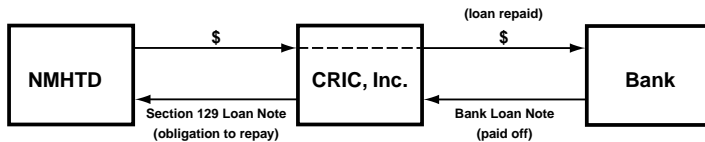
Key Aspects of the Camino Real Loan Guarantee Structure

Upon obtaining the bank loan, CRIC, Inc., will use the loan proceeds received from the bank to pay preconstruction costs.



At the time the bank loan is made, CRIC, Inc., will also enter into a Section 129 loan agreement with NMHTD, but no funds will change hands pursuant to that loan.

At maturity of the bank loan, if CRIC, Inc., is unable to obtain permanent financing to pay off the preconstruction loan (as well as to fund construction), CRIC, Inc., will draw on the Section 129 loan from NMHTD and use those funds to pay off the bank loan. CRIC, Inc., would then be obligated to repay the Section 129 loan to NMHTD. To reduce the department's exposure in the event of a draw on the Section 129 loan, CRIC, Inc.'s, bank letter of credit would be drawn on and those funds used to partially pay off the Section 129 loan.



The Camino Real project illustrates how public funding can be used to leverage extensive private investment in transportation infrastructure. Private-sector funding can be used in situations offering enough economic potential, but the public money is often needed to handle development costs and glue the deal together. And nothing is certain until the shovel hits the ground.

The state of New Mexico's financial involvement in the project will be limited in both amount and time and is targeted to the risky development period of the project. The state hopes to achieve considerable

return in terms of economic development and increased trade. The loan guarantee provided represents less than 10 percent of the project's total costs and is expected to last 2 years or less. By targeting the loan guarantee to the early, preconstruction phase of the project's development, public-sector risk will decrease after the initial period. Once over the developmental hump, private-sector funding is expected to pay substantially all of the project's operating and capital costs.

CRIC is still in development and presents another of the difficulties in implementing and financing intermodal facilities—interstate competition. Although an objective is to relieve congestion in the neighboring El Paso area, it will also compete with those facilities for traffic. As older cities elsewhere have learned, congestion, while painful, goes along with jobs and commerce that can be sucked away by competitors. Thus, stakeholders in the existing corridor may well object and react by enhancements of their own. How much the federal government chooses to become involved in such competition among state and local jurisdictions for the location of facilities is a difficult and ultimately a political question.

ASSESSMENT OF PUBLIC-SECTOR FINANCIAL INVOLVEMENT

The area of public financial involvement in intermodal facilities is not standardized, nor are the means of financial assistance institutionalized. Hence, prescriptions for financing schemes are necessarily administered on a case-by-case basis. That in itself is an argument for the very types of “cut to fit” arrangements that have characterized public financial involvement to date.

There is the question of the scale of the project to be financed. Clearly some projects are primarily of local or regional interest. With the growing institutional awareness of the need for flexibility and the progress to date on loosening federal funding constraints, it appears that federal aid will be more available for the more locally oriented intermodal projects under the standard highway programs. What the states do with regard to aiding local and regional intermodal facilities tends to be a matter of state and local priorities. In any event, the projects, while significant to some and perhaps marginally helpful to many, are not of national significance.

“Megaprojects,” such as those at international portals and the intersections of the major freight corridors, require large expenditures and affect large numbers of parties both at the site and downstream. The appropriate federal role appears to be exactly the one that it has played, providing a “wrapper of credit comfort” in addition to allowing states to redirect their conventional aid toward supporting projects they believe are useful. However, such federal aid should be provided with an exit strategy in mind. The claims of private benefit and local economic effect are significant, and it is appropriate that projects should be largely self-financing and depend largely on the joint efforts of the affected and immediately benefiting parties, the facility user groups, and the local and state jurisdictions to do the heavy lifting.

But it is an unfortunate fact of economic life that many of the users of the intermodal facilities are members of a highly competitive industry. The competition benefits society, but it also limits the degree to which individual firms can be expected to commit to long-term investments. In that case, society benefits by keeping near-term prices low but pays in the long term by not having a longer-range investment horizon. The individual firms may come and go, but the site and the intermodal need will persist. The users and immediate beneficiaries should pay, but the host governments involved have a longer-term and geographic-specific interest; they can and should shoulder a portion of the start-up and longer-term risk if they wish to remain a transport hub. If they aspire to become one, the risk they must bear (as the toll road discussions demonstrate) is proportionately greater.

Benefit-cost estimates are important to make despite the uncertainties and estimates they necessarily contain. When done in conjunction with the straightforward financial feasibility study (such as contained in a revenue bond-backed enterprise project), they provide a logical, quantified backdrop as to why the public sector has an interest and is involved in the project. Nonetheless, benefit-cost analyses have their limitations. They attempt to bring everything forward to a present-period value, and when high discount rates are used (as is the case in the private sector), great weight is given to near-term values. Second, they are best on discrete projects on a given mode. Mixed projects that span several facilities, jurisdictions, and modes can be

awkward when several trade-offs must be matched up.²² Finally, as analytical tools, they work best where ways of doing business are well established and are unlikely to shift rapidly. They are increasingly unreliable where there are imponderables and feedbacks that cannot be perfectly foreseen. Massive projects like the Interstate system totally reoriented living and trade patterns and the economies of regions. The Interstate highways also made possible the use of large trucks and an enormous change in distribution patterns.

The greatest barrier to providing federal aid is both practical and philosophical and has to do with practicing triage: providing help where it really makes a difference as opposed to where it will not or is not needed anyway. There are major projects that the private sector and the state and local governments can hash out among themselves. The auctioning off of site locations among competing governments may be distasteful, but it is part and parcel of the competitive system that obtains among governments as well as in most private markets. However, providing federal assistance, unless it is made equally or, at least, proportionately available using some politically acceptable criterion, will necessarily be helpful to a select few.

The criterion for selection must be that for special aid to be given, the project's circumstances are uniquely challenging and heavily charged with a national interest. The very dynamic of the transportation industry today indicates that only a few major ports of entry and a few key inland terminals fit that description. In other words, in the absence of a broad geographic incidence of "intermodal freight facility problems," it is really not desirable to crank the local terminal factor into federal distribution formulas. If the political will is there and the basic economics justify it, then sufficiently flexible funding should accommodate states' using their own money (and federal transportation grants) that way if they so choose.

The conclusion is that federal aid should be minimized and most likely be in the form of credit assistance where there is a substantial

²² An example is the case of the competition between two ports, where improvements at one will result in reduced traffic for the other. This will involve regionally a net gain for the former, a net loss for the latter, and maybe a gain overall (nationally). Clearly the federal government wants the overall improvements to occur. To avoid playing political favorites it is best advised to make the aid available on the same terms to each and let the "highest bidder" that can mobilize other needed sources win the prize.

nonfederal benefit to be gained by market participants and the host governments. The reasoning is both purist and practical; credit enhancement is the federal government's strong point, and where it can leverage private capital flows by absorbing certain levels of risk and galvanize deals by providing front-end capital, it is getting the most for the dollars committed.

The distinction between credit enhancements and direct loans is not always straightforward. The Alameda Corridor provides an example of a situation where the existence of a take-out direct loan is in fact a credit enhancement (a standby loan facility). Whereas there is a negative pledge that the loan in no way involves a federal guarantee, by virtue of the loan "standing by," it provides that so long as the project's borrowing stays within a boundary amount (loan limit) the federal government will lend the amount needed on demand.

Credit assistance, direct or standby, sets up public assets and private (or subnational government) liabilities where they should be, on the balance sheet. Such an accounting treatment forces, over time, a dollar-for-dollar recognition that an investment has been made rather than a gratuity extended. Whereas a capital grant can be spent today and forgotten tomorrow, a credit support stays to be extinguished and accommodates the review of the payoff over time.

An analogy to the student loan program may be made. There is substantial public interest in making higher education available, but there is a clear economic benefit over time to most individuals who make the investment, and it should be recognized with patient but insistent requirements for repayment over the years. The depth of the subsidy and the most efficient way to deliver it are other important matters of policy, but the principle of repayment when and to the extent there is individually enjoyed benefit—personal, corporate, or jurisdictional—is a compelling one.

The author's limited information indicates that the number of significant international intermodal seaports is two or three on each coast and that the number of key border crossings is similar. An economical solution appears to be designation of the ports of entry and limited assistance along the lines of the credit provided for the Alameda Corridor. In areas where the trade accommodated is primarily domestic, aside from the ancillary assistance provided by the highway money, there appears to be little justification for "special" federal aid. But where

it is extended, the credit assistance model, requiring that the private and state and local players come up with most of the capital and absorb a share of the risk themselves, is the best alternative.

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FHWA	Federal Highway Administration
GAO	General Accounting Office

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