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## **Assessing intermodal transportation planning at state departments of transportation**

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**Abstract:** We assessed the practice of freight and passenger intermodal planning at seven state departments of transportation – Alabama, Arizona, Colorado, Florida, Louisiana, Mississippi, and Texas – through analyses of previous studies, long- and short-range plans, organisational structures, surveys, and interviews. Results indicate that these states have altered their organisational structures and have produced plans that increasingly reflect an intermodal orientation, but that Florida and Louisiana were rated somewhat higher. Specific intermodal projects, public participation, and coordination among agencies tended to be rated more highly, while funding for and state DOT attitudes toward transit, bicycle/pedestrian, and intermodal connectors were rated much lower.

**Keywords:** intermodal planning; US state departments of transportation; agency coordination; transportation funding; freight intermodal projects; passenger intermodal projects.

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## **1 Introduction**

Much of transportation planning in the USA has traditionally been carried out at the state and local levels rather than at the federal level. The key agency is the state Department of Transportation (state DOT). All state DOTs originated as departments of highways in the late 1800s or early 1900s period, but grew most rapidly during the early phases of the Interstate Highway era in the 1950s and 1960s, thus becoming infused with the mission of building the Interstate Highway System. By the 1970s, however, there was growing recognition that highway construction was only part of the universe of functions involved in the movement of people and freight and a new vision began to emerge.

By the 1990s the construction of interstate highways was winding down and a new transportation vision had emerged, based on intermodalism. This is not to say, of course, that the ‘highway lobby’ would lose its influence or that new highway construction would not continue. Rodney Slater, Secretary of Transportation in the Clinton Administration specifically raised the following question, “How should we define a system for the 21st century that will dominate as the Big I – the Interstate – did in this century?” He answered his question by saying that such a system must be international, intermodal, intelligent and inclusive (Slater, 1998, p.82).

Slater’s concern with intermodalism reflected the new era in transportation policy and planning which had been inaugurated by the groundbreaking Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. Through its explicit use of the word ‘intermodal’ in the title, this legislation was intended to “bring the need for intermodalism to the forefront of the nation’s transportation and economic debate” (ISTEA, 1991). More specifically, ISTEA introduced several innovations into transportation planning practices including:

- increasing flexibility for state and local governments to redirect highway funds to accommodate other modes and modal connections
- directly linking transportation planning with air quality planning
- enhancing the role of metropolitan planning organisations in regional transportation planning
- broadening the goals for transportation planning
- increasing the number and variety of stakeholders that should be involved in the transportation planning process.

ISTEA also specifically required state DOTs to adopt an intermodal approach to transportation planning, as reflected by their long-range and short-range plans, their resource allocations and the characteristics of their planning processes. State plans and programmes were required to develop systems and facilities “that will function as an intermodal transportation system for the metropolitan area and as an integral part of the intermodal transportation system for the state and the USA”.<sup>1</sup> Nevertheless, the major funding source for transportation remained the Highway Trust Fund, generated largely by taxes on motor fuels. Over the years, efforts have been made to divert some of these funds to non-highway modes and the promulgation of ISTEA in 1991 made this a reality to a limited extent. The shift away from an emphasis on Single-Occupant Vehicle (SOV)

transportation on roads and highways was reinforced by both the TEA-21 (1998) and SAFETEA-LU (2005) legislations.

Thus, since ISTEA, it has been expected that state DOTs would expand their horizons and more fully incorporate aviation and airports, bicycle and pedestrian transportation, maritime transportation and seaports, public transportation (including buses, rail transit, ferries and other transit modes), railroads and trucking into their long-range and short-range statewide transportation plans. The purpose of this study was to determine to what extent such a change has, in fact, occurred in selected state DOTs.

Specifically, this study assesses the degree to which freight and passenger intermodal transportation planning has been carried out and implemented by seven state DOTs in southern and western USA – Alabama, Arizona, Colorado, Florida, Louisiana, Mississippi and Texas. These states, while not representative of the universe of states, are nonetheless representative of an important subset, i.e., growing Sunbelt states that face particularly difficult transportation challenges. This research also builds upon a previous Congressional study, “Metropolitan Planning Organisations: An Assessment of the Transportation Planning Process”, conducted by the University of Denver Intermodal Transportation Institute (ITI) and National Centre for Intermodal Transportation (NCIT) that examined transportation planning processes in Dallas, Denver and Phoenix (Dempsey et al., 2000). That study identified significant differences in those processes owing in part to the role that state DOTs play. Accordingly, in order to understand the degree to which intermodal planning is being achieved, it is essential to consider the ways in which the state DOTs are developing plans, allocating resources and working with stakeholders.

This research effort involved the collection of data from each of the seven state DOTs in the form of long-range plans, short-range programs, more specialised plans and organisational structures. Additional data were obtained via personal and telephone interviews with leading experts in each state as well as e-mail questionnaires regarding the degree to which freight and passenger intermodal issues are being addressed in statewide transportation planning processes. Further insight was gained from reviewing the literature on statewide multimodal and intermodal transportation planning. Analysis of this information enabled us to determine the ways in which the goals of ISTEA and TEA-21 are being met and to identify examples of best practices in implementing intermodal transportation planning activities within the seven states included in this study.

After an overview of the relevant literature on statewide intermodal planning, a brief description of the data and methods used in the study is provided. Results for each of the seven states are then presented in a comparative framework, followed by conclusions.

## **2 Historical background and recent research on intermodal transportation planning at state DOTs**

Shortly after ISTEA was promulgated, several conferences and workshops were held that set out to decipher the meaning and implications of the new legislation for the US DOT, state DOTs, MPOs, transit agencies, local governments and the private sector.

## 2.1 Definitions

The first priority was to define the meaning and scope of intermodalism and its implications for planning. At first, intermodalism was simply defined as transportation involving two or more modes during a single journey, usually in a freight context. However, the need for a broader perspective soon emerged and was the focus of the 1992 *ISTEA and Intermodal Planning* conference held in Irvine, California (Transportation Research Board (TRB), 1993). Attendees at this conference grappled with the meaning and definition of intermodalism and differentiated between multimodal planning (system choices) from intermodal planning (the most efficient way of moving from point-to-point within the system). Attendees also identified partnerships, freight movements, performance improvements and the development of intermodal management systems as important elements within an intermodal planning process. At this meeting, Martinez (1993) presented a definition of intermodalism developed by a working group at the US Department of Transportation. It identified the following as key elements of the intermodal approach:

- *Choice* among transportation options provided by competing modes, independently or in combination. (Choice also means that decision makers need to consider alternative systems to address transportation needs before investing in infrastructure.)
- *Connections* that provide convenient, rapid, efficient and safe transfer of people or goods from one mode to another (including end point, pickup and delivery) during a single journey to provide the highest quality and most comprehensive transportation service for cost.
- *Coordination and cooperation* among transportation organisations to improve transportation service, quality, safety and efficiency across all modes or combinations of modes in an environmentally sound manner.

Some scholars argued that this definition, while broader than many, still failed to capture the goal of intermodalism. Efficiency should not be defined solely in economic terms, other considerations such as the environment and social equity had to be taken into account. In other words an intermodal system that was based only on the concept of economic efficiency need not necessarily promote the general welfare. Such a perspective required that intermodalism be defined as

“a system in which the individual modes are linked, governed and managed in a manner that creates a seamless and sustainable transportation system; such a system should be economically efficient, environmentally sound, safe and secure and ethically based.” (Szyliowicz, 2000, p.304)

This definition was included in a paper that sought to identify the promise of intermodalism and the challenges that had to be confronted. It was part of a symposium sponsored by the National Centre for Intermodal Transportation and the Intermodal Transportation Institute (University of Denver) that covered many hitherto neglected aspects of intermodalism such as passengers, law and regulation and education and training.

## 2.2 *Planning processes*

Concurrently with these conferences, researchers in programmes such as the National Cooperative Highway Research Program (NCHRP) and the Transit Cooperative Research Program (TCRP) were conducting a number of studies on statewide multimodal/intermodal transportation planning. Major transportation organisations such as the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the American Association of State Highway and Transportation Officials (AASHTO), some state DOTs, university research centres and other groups have also sponsored research on statewide intermodal planning.

Balloffet and Associates, Inc. (1995) conducted *Examples of Statewide Transportation Planning Practices* in conjunction with FHWA and FTA. The intent of the study was to disseminate information about innovative approaches and practices in response to ISTEA statewide planning requirements. With recommendations from FHWA staff, 24 state DOTs were identified and contacted via phone interviews to determine which states' approaches and practices merited further investigation. A review panel of state DOT representatives, FHWA staff and FTA staff identified those states engaging in best practices within each of eight categories. These categories are particularly noteworthy because of their comprehensiveness and specific concern with public involvement. They are as follows:

- Coordination of statewide and metropolitan planning
  - Florida
  - Iowa
- Form and content of statewide transportation plans and improvement programs
  - Florida
  - Texas
- Comprehensive transportation planning
  - Washington
  - Wisconsin
- Management systems
  - California
  - Colorado
  - Missouri
  - New Jersey
- Public involvement
  - Idaho
  - Iowa
  - Wisconsin

- Social, economic and environmental issues
  - Oregon
  - Washington
  - Wisconsin
- Transportation system management and operations
  - Arkansas
  - Washington
  - Wisconsin
- Investment and finance issues
  - Colorado
  - Wisconsin.

Among the states that were the focus of the current study, Colorado and Florida were identified twice for best practices and Texas once. A modular, proof-of-concept approach to management systems development was highlighted for Colorado, in addition to its flexible and pragmatic investment strategy. Florida was recognised for its approach to cooperative planning through developing appropriate planning tools and by recognising the contribution of interest groups to the planning process, as well as developing an approach that is explicitly intermodal. Texas was recognised for its success in integrating long-range planning with short-term programming.

Another FHWA/FTA study, *Statewide Transportation Planning Under ISTEA: A New Framework for Decisionmaking*, prepared by Siwek and Associates, Inc. (1996), was a guidebook intended principally for elected officials and policy makers. Examples of best practices were provided throughout the book in sidebar formats. Among the states recognised were Maine and Ohio for new freight intermodal facilities; Wisconsin for its public involvement program; Colorado for integrating its management systems into the planning process; Washington for integrating environmental concerns into the planning process; and Ohio, California, Oregon and New Jersey for specific innovative transportation projects. New Jersey, Florida and Pennsylvania were commended for communication tools that explained to the general public the intent of their transportation plans.

The National Cooperative Highway Research Program initiated a series of projects in the mid-1990s to address various topics involving multimodal transportation planning. One of these projects, *Innovative Practices for Multimodal Transportation Planning for Freight and Passengers*, resulted in a comprehensive report conducted by TransManagement Inc. (1998) in association with Matthew Coogan and Michael Meyer that represented a broad range of multimodal planning considerations. Based on numerous interviews and an extensive bibliographic database, innovative intermodal practices by state DOTs, MPOs and one airport were identified in each of six categories, as follows:

- Organising to promote multimodal decisionmaking
  - Washington State DOT (WsDOT)
  - Maryland DOT
  - Minnesota DOT
- Innovative methods in multimodal planning and programming
  - Wisconsin DOT TransLinks 21 statewide planning process
  - Portland MPO
  - Washington DOT *Eastern Washington Intermodal Transportation Study*
  - Puget Sound Regional Council (Seattle MPO) *Freight and Goods Mobility Study*
- Management systems and the development of measures for the monitoring of performance
  - Florida DOT
  - Oregon DOT
  - Boston Logan International Airport
- Innovative methods of public involvement
  - East-West Gateway Coordinating Council (St. Louis MPO)
  - Maine DOT
  - Ada County, Idaho Planning Association (Boise MPO)
- Approaches to multimodal planning affecting rural areas
  - Colorado DOT
  - Vermont Agency of Transportation
  - Minnesota DOT
- Approaches to financial constraint in planning and programming
  - Southeastern Pennsylvania Regional Planning Commission (Philadelphia MPO)
  - Minnesota DOT
  - Wisconsin DOT.

Among the state DOTs that are the focus of this study, Colorado DOT's explicit inclusion of rural regions in the statewide planning process was identified as an innovative practice. Shortly after the Colorado Department of Highways became the Department of Transportation, the newly created Division of Transportation Development created 15 transportation planning regions throughout the state: five in MPO-designated areas and ten in mostly rural areas. Colorado DOT staff surveyed all counties and municipalities to incorporate local perspectives in delimiting the planning regions. Rural regions received additional funding and technical guidance (including development of a guidebook) to assist their transportation planning efforts. Additionally, Florida DOT was recognised for its innovative performance monitoring and evaluation. In particular, distinctions were made between the *output* of an agency (e.g., number of lane-miles

resurfaced), *efficiency* of an agency (e.g., cost per lane-mile resurfaced) and *outcome* experienced by the end user (e.g., increased mobility). Florida illustrated a commitment to tying performance monitoring to achievement of goals in its statewide plan.

Other scholars also focused on identifying the best planning practices. Boske (1998, 1999) directed two reports for the LBJ School of Public Affairs and Centre for Transportation Research at the University of Texas – Austin: *Multimodal/Intermodal Transportation in the United States, Western Europe and Latin America* and *Case Studies of Multimodal/Intermodal Transportation Planning Methods, Funding Programs and Projects*. The case studies identified were divided into three categories, as follows, although the methodology by which these case studies were selected was not explicitly stated (US case studies listed only):

- Best practices in multimodal/intermodal planning methods
  - Florida intermodal planning process
  - Miami-Dade County planning process
  - Oregon corridor planning process
  - Pennsylvania policy plan
  - Washington State freight planning process
  - Washington State regional planning process
  - Wisconsin statewide multimodal and intermodal plan
- Selected multimodal/intermodal funding programs
  - Florida intermodal development program
  - Florida seaport transportation and economic development program
  - Tennessee transportation equity fund
  - Wisconsin freight railroad infrastructure improvement program
  - Wisconsin transportation economic assistance program
- Selected multimodal/intermodal projects
  - Florida trade data centre
  - Fort Worth Alliance international trade and logistics centre
  - Philadelphia metropolitan area intermodal coordination
  - Washington State's FAST corridor project.

Of the states that are of primary interest to this study, Florida DOT was found to have exemplary practices in its comprehensive, integrated and ongoing planning process, including its cooperation with Miami-Dade County on intermodal planning. Innovative financing programmes have been developed specifically for intermodal projects in Florida and numerous partnerships typify their intermodal activities. Also, Texas (Fort Worth) was singled out due to the Fort Worth Alliance International Trade and Logistics Centre being recognised as one of the finest examples of a private-public partnership in the history of the Texas DOT.

Arnold et al. (1999) conducted a survey of transportation planning practices in state departments of transportation for the Virginia DOT. The purpose of the project was to identify practices that Virginia DOT might consider adopting. Topics included organisation and management of transportation planning, coordination between the DOT and MPOs, public involvement procedures, intermodal planning and congestion management procedures and use of consultants for transportation planning activities. Surveys were sent to 50 members of AASHTO's Standing Committee on Planning, representing each state DOT; 38 responded. As regards intermodal planning, at least 30 of the 38 responding state DOTs include air, transit/public transportation, trucking, passenger and freight rail, bicycles and pedestrians in their planning efforts. Exactly half of the respondents had or were in the process of completing an Intermodal Management System (IMS). Coordination between modes is generally considered to be the most effective aspect of intermodal planning. A problem with private sector cooperation was identified because the state DOT lacks jurisdiction over these modes, lacks contacts with the private sector and has difficulty obtaining data and other information. Private sector firms often lack the time and/or inclination to be involved in the statewide intermodal planning process on an on-going basis, but they tend to be more involved on a project-specific basis. It was recommended that Virginia DOT should include air, water, trucking and freight rail in their planning activities and should develop an IMS on the basis of the benefits cited by other state DOTs that engage in these planning activities.

In a follow-up survey conducted for the Virginia Transportation Research Council, Fontaine and Miller (2002) interviewed representatives from a small group of state DOTs identifying innovative techniques in statewide multimodal planning. Based on recommendations from experts at FHWA and the TRB Committee on Statewide Multimodal Planning, ten states that were most often mentioned as having exemplary programmes for multimodal planning were selected for this study, as follows: Florida, Maine, Maryland, Michigan, Minnesota, New Jersey, North Carolina, Oregon, Washington and Wisconsin. Innovative techniques in state DOT organisation included the creation and integration of new modal units responsible for planning for a specific mode, as well as increased levels of cooperation between these units and sharing of modal-specific information. Innovations in multimodal practices included the use of modally-blind performance measures and the creation of special offices to coordinate with MPOs and other urban transportation agencies in multimodal planning. Public outreach tactics included the use of 800 numbers for comments, the creation of freight advisory committees and the development of workshops and charettes to train staff members in facilitating community consensus.

In an NCHRP synthesis report, Peyrebrune (2000) examined *Multimodal Aspects of Statewide Transportation Planning*. This synthesis consisted of a broad review of literature on statewide multimodal planning, a survey of current practices at state DOTs and examination of several specific case studies of good practices. The survey questionnaire sought to determine whether multimodal aspects of alternatives, modal mix and integration were being used in state transportation plans; corridor studies; and financing, budgeting and programming. The survey also was used to identify potential case studies. Surveys were sent to each of the 50 state DOTs; 38 responses were received. Survey results indicated that almost all respondent states actually consider multimodal aspects in their state transportation plans and corridor studies, while slightly fewer consider these aspects in their finance, budgeting and programming. The state of the practice was found to be fairly advanced regarding multimodal aspects in plans, policies,

programs and projects. Several states have integrated and institutionalised multimodal aspects into the agency culture whereby “the theoretical view of multimodalism (a ‘modally-blind’ analysis process) is practiced in one or more statewide processes”. Instead of repeating case studies cited in previous research, this study focused on practices in four states – New York, Delaware, Iowa and New Hampshire – that previously had not received as much attention, in addition to revisiting Wisconsin’s TransLinks 21 multimodal plan.

Finally, a study conducted for the FHWA (Noerager and Lyons, 2002) evaluated statewide long-range plans. Noteworthy practices by state DOTs were identified in several topic areas: financial planning (Iowa, Idaho, Ohio, Washington), freight transportation and integration with passenger needs (Missouri, Colorado), goals and performance measures (Pennsylvania, Nevada), identification of major issues and challenges<sup>2</sup> (Arizona, Pennsylvania, Oregon), public involvement (Pennsylvania, New Mexico, Missouri, Florida), relationships between state DOTs and other governmental agencies (Ohio, Nebraska) and safety (North Carolina, Maine, Louisiana).

Arizona’s long-range plan was noted for its integration of the key socio-economic issues and variables that would influence the mobility needs of the state and have to be taken into account when planning the future transportation system. These factors – the pattern of population and economic growth – are assessed over three time periods. The Plan was also praised for its analysis of the role of technology, especially telecommunications, on transportation; for its discussion of energy futures; and for its realistic appraisal of growing congestion owing to the continuing domination of the automobile and trucks. It concludes:

“The discussion of these issues and challenges in the different time periods and with the differing probability levels, contribute to a plan that appears to incorporate consideration of these issues throughout the planning process.”  
(Noerager and Lyons, 2002, p.22)

Noerager and Lyons (2002) also singled out Colorado’s 2020 plan for certain examples of noteworthy practices. They acknowledged Colorado’s explicit recognition of freight as a driving force in the state economy and the more extensive freight planning efforts in the 2020 plan than in the previous plan. Several freight-oriented studies, including the Western Transportation Trade Study, the draft Colorado Rail Needs Study and the draft Freight Infrastructure Study, were identified as indicators of this recognition. Colorado’s 2020 plan was also singled out for how it portrayed its transportation needs within a broader economic and environmental context, including the decline of mining and the rise of service and retail trade as well as the impacts from development and increased mobility on the natural environment, particularly habitats for threatened and endangered species. Finally, an emphasis upon safety in Colorado’s 2020 plan was identified, particularly its inclusion as one of five investment categories in a performance-based transportation investment strategy.

### *2.3 Implementation*

The 1994 *National Conference on Intermodalism: Making the Case, Making It Happen* in New Orleans (TRB, 1996) was designed to focus on identifying early examples of intermodal projects and success stories. Intermodalism was viewed as an evolutionary process whereby planners and other transportation professionals were engaged in

learning-by-doing, thus exploring how to make intermodalism happen through innovative financing, successful partnerships, a greater understanding of the broader societal benefits of intermodalism and a better appreciation of technological advances. Specific projects such as the Alameda freight corridor project in Southern California, the Union Station case study in Washington, DC and the New York/New Jersey airport regional access study were cited as good examples of an intermodal approach to planning because of their economic, environmental and safety benefits. For state DOTs, one of the biggest challenges was the ISTEA mandate to prepare statewide intermodal transportation plans. Representatives from Louisiana, Wisconsin, New York, Florida, Washington, Pennsylvania and Maryland discussed various intermodal planning initiatives within their state DOTs. In both Louisiana and Wisconsin, extensive outreach efforts (interviews and surveys) were important in developing a customer-based focus to help guide investments and enhance intermodal system performance as part of their statewide intermodal planning process. Wisconsin's Translinks 21 plan, New York's full freight access study for Lower Manhattan, the Eastern Washington Intermodal Transportation Study and Pennsylvania's Double Stack Clearance project all were cited as examples of the importance of intermodal freight planning to economic development. In Florida, the East-West Multimodal Corridor Study, the Miami Intermodal Centre (MIC) study and the Interstate 4 Multimodal Master Plan were identified as integral examples of their statewide intermodal plan, while Maryland's ongoing experience in intermodalism has yielded effective planning and funding strategies that encouraged an intermodal perspective.

Concern with the degree to which state DOTs were moving in an intermodal direction led to *A Conference on Refocusing Statewide Transportation Planning for the 21st century* (TRB, 2000), which was held in Girdwood, Alaska in July 1999. This meeting featured discussions related to the recently-promulgated Transportation Equity Act for the 21st century (TEA-21). Gloria Jeff, Deputy Administrator at FHWA and former state planner at Michigan DOT, presented the 'Top 10 Issues' facing statewide planning in the 21st century as part of her keynote address, including #10 "Planning will be multimodal and intermodal", and #9 "This is not your father's state DOT".

Despite all the attention being paid to intermodalism, it was not at all obvious that state DOTs were energetically embracing this concept. Lipsman and Walter (1998) surveyed state DOTs to assess how planning programmes have changed to reflect the direction set by ISTEA. A questionnaire was sent to each of the 50 state DOTs; 46 responded. The purpose of the questionnaire was threefold:

- to identify states' multimodal perspectives and barriers encountered in developing multimodal plans
- to determine resources and skills needed for multimodal planning
- to identify preferences for future ISTEA-type legislation.

Only 63% of the states surveyed had an intermodal management system either completed or in process, the lowest percentage for any of the six management systems identified in ISTEA. Just over half of the states' plans included passenger and/or freight intermodal projects. Rail-highway conflicts and intercity bus/rail terminal joint location were the intermodal issues mentioned most frequently. In states larger in area and lower in population density, intercity bus/air terminal joint location was also mentioned frequently. States identified the need for additional training in specific areas such as

geographic information systems, transportation economics, transport network development and modelling, benefit-cost analysis and financial analysis for the purpose of more effective intermodal planning.

#### 2.4 Barriers

Some studies dealt primarily with such issues. A very extensive TCRP report, *Institutional Barriers to Intermodal Policies and Planning in Metropolitan Areas* was prepared by Crain and Associates, Inc. with Pacific Consulting Group (1996). The actual research involved four distinct phases:

- identification of barriers
- prioritisation of improvement opportunities
- implementation forums
- identification of strategies.

Structured interviews were held with 41 representatives of transit agencies, metropolitan planning organisations, state DOTs, industry associations and the US DOT to identify institutional barriers to intermodal planning. These barriers were organised into three categories:

- organisational barriers (modal separation, regulatory and legal restrictions, organisational culture and modal orientation)
- interjurisdictional barriers (different views about authority and responsibility, reluctance to form partnerships, insufficient track record in forging relationships, pre-determined solutions overshadowing needs assessments, poorly integrated land use and transportation policies)
- resource barriers (significant funding shortfalls, insufficient information, insufficient staff resources, inadequate tools for comparing mobility projects).

Improvement opportunities were identified through a mail-back survey of 421 individuals responsible for intermodal planning at state, regional and local levels (60 from state DOTs; 181 from MPOs; 160 from transit agencies; and 20 from cities, counties, or Indian reservations). The top priorities identified in the survey for improving intermodal planning were:

- building a constituency for the intermodal planning concept
- improved federal funding (particularly from the transit agency perspective)
- educating key parties
- visible leadership support
- inviting citizen input
- mobilising business leadership.

Survey respondents also provided examples of successful intermodal planning: development of intermodal transfer facilities and intermodal elements of long-range plans

were the most frequently mentioned items. Three 2-day implementation forums were held in Albuquerque, New Mexico; the Austin-San Antonio corridor in Texas and Queens, New York to discuss in more depth the barriers to intermodal planning and strategies to overcome these barriers.

In conclusion, this study found that most decision makers were pleased with ISTEA policies but frustrated by many of the implementing regulations. The ISTEA philosophies of decentralised decision making, strengthened connections to environmental policy and the economically efficient movement of people and goods were widely supported. Greater leadership commitment, new regional constituencies, increased funding and additional information on intermodal choices were the primary means by which barriers to intermodal planning can be overcome.

An important barrier to intermodal planning is the need for cooperation between many different actors, notably between public agencies and the private sector. Kimley-Horn and Associates Inc. (1999) focused on this issue in the NCHRP report, *Guidelines for Developing and Maintaining Successful Partnerships for Multimodal Transportation Projects*. This report discusses such issues of importance to practitioners as:

- What partnerships are, why they are important and how they can be used in the context of multimodal transportation planning and development
- What tools are available to transportation professionals in developing partnerships
- How partnerships can be maintained over time to support and sustain progress
- Summary information on case studies that were investigated during the research project.

Two highlighted case studies of particular interest are the Summit Stage Intermodal Transfer Centre in Summit County, Colorado and the TransGuide ITS Project in San Antonio, Texas. The Summit Stage project benefited from development of a public-private partnership supported strongly by the Colorado DOT. Texas DOT spearheaded the effort to build a Traffic Operations Centre in San Antonio and develop a start-of-the-art Traffic Management System in partnership with the City of San Antonio, the VIA metropolitan transit system, Allied Signal Technical Services Corporation and approximately 70 subcontractors involved in the project.

Interaction between state DOTs and Metropolitan Planning Organisations represent another major barrier. A specific study, *Metropolitan Planning Organisations: An Assessment of the Transportation Planning Process* (Dempsey et al., 2000) examined transportation planning processes in Dallas, Denver, Phoenix and Seattle. A particularly relevant outcome of this research was how important the state DOT-MPO relationship was to the overall success of metropolitan transportation planning. In fact, the nature of this relationship made a dramatic difference in whether the overall planning process was perceived positively or negatively. Furthermore, even though MPOs had attained some measure of fiscal independence in selecting projects as a result of ISTEA and TEA-21, they still were heavily dependent on funding controlled by state DOTs. So, the role of state DOTs remains critically important to the success of both statewide and metropolitan planning.

### **3 Data and methods**

This study analyses the intermodal transportation planning effectiveness of state DOTs in three relatively large, fast-growing western states – Arizona, Colorado and Texas – and four states in the southeast – Alabama, Florida, Louisiana and Mississippi. The study addresses issues such as leadership support for intermodalism, effectiveness of planning processes and implementation capabilities, adequacy of funding for intermodalism, coordination and communication between and among, relevant organisations and provision of a range of transportation mode choices. Additional information about the best intermodal projects in each state also was obtained.

To collect data on the effectiveness of state DOT intermodal planning processes, four measurement strategies were followed:

- analysis of institutional structures and recent plans produced by the state DOTs
- paper questionnaires to collect effectiveness ratings across a wide range of participants and observers accompanied by self-addressed postage-paid envelopes
- electronic version of the paper survey distributed by e-mail
- face-to-face and phone interviews to collect more in-depth responses from a more selective group of experts most knowledgeable about state DOT planning processes.

A total of 325 respondents chose to take part in this study: Arizona (27 respondents), Colorado (40 respondents), Texas (41 respondents), Alabama (24 respondents), Florida (133 respondents), Louisiana (23 respondents) and Mississippi (30 respondents). All respondents were involved in or affected by the state DOT transportation planning process. A stratified random-sampling approach was used to create comparable samples across the four states for the in-depth structured interviews, based on the following categories of participants:

- state DOT executive directors and planning directors
- MPO executive directors and transportation planning directors
- transit agency executive directors and planning directors
- port authority executive directors and planning directors
- rural transportation planning officials
- statewide transportation commission members
- state legislators – transportation committee chairs.

Responses obtained to the open-ended questions about the overall quality of intermodal planning in the face-to-face interviews with current transportation leaders are emphasised in the qualitative analysis.

Using the definition of intermodalism developed by US DOT (TRB, 1993) that has been used in other studies (Crain and Associates, Inc., with Pacific Consulting Group, 1996; Dempsey et al., 2000), the survey instrument assessed intermodal planning by collecting information as to the degree to which:

- The state DOT leadership:
  - espouses an intermodal vision
  - supports projects that promote intermodalism
  - provides effective support for intermodal planning
- The state DOT's planning process:
  - gives equal consideration to the full range of transportation alternatives
  - uses adequate planning and analysis tools to make intermodal decisions
  - effectively incorporates public involvement in the planning process
  - effectively incorporates an intermodal approach to planning in general
- The state DOT provides:
  - training for the staff regarding an intermodal approach to planning
  - sufficient resources available for intermodal planning
- The various aspects of ISTEA/TEA-21 funding and related regulations facilitate intermodalism by:
  - ensuring adequate state funding to support intermodal projects
  - providing sufficient federal funding to support intermodal projects
  - encouraging state DOT support in guiding the use of flexible funds for intermodal planning and projects
  - ensuring that the state DOT meets the legislative intent of ISTEA/TEA-21 regarding intermodalism
- There is:
  - good communication within the state DOT
  - coordination between the state DOT and Metropolitan Planning Organisations (MPOs)
  - coordination between the state DOT and rural planning organisations
  - coordination between the state DOT and regional transit agencies
  - coordination between the state DOT and freight transportation organisations (maritime, trucking, rail, air cargo, etc.)
  - effective state DOT coordination and communication regarding intermodal planning in an overall sense

- The state DOT satisfies transportation needs in terms of investment in:
  - roadway construction
  - operational/safety improvements
  - investment in transit and bus service
  - investment in bicycle and pedestrian facilities
  - intermodal connecting facilities.

Respondents also were asked to identify and assess the effectiveness of the best intermodal projects in their respective states.

#### **4 Assessment of intermodal planning at state DOTs**

The results of the analyses of the questionnaire responses and interviews are presented in this section. Each state Department of Transportation has certain organisational and transportation characteristics specific to the state that it represents, depending on history, geography, legislation and other circumstances. Also, each state DOT has responded to the call for a more intermodal approach to planning in different ways, as exemplified by differences in planning procedures, institutional structures, long-range plans and specific plans geared to intermodal initiatives. All of this background information was important when assessing the survey results that indicate how each state DOT has performed regarding intermodal planning.

Results indicate that these states have made some significant strides in adopting an intermodal approach to planning as reflected by their organisational structures. Alabama DOT has a Bureau of Multimodal Transportation that is responsible for the management and oversight of intermodal programs. The Bureau also is responsible for administering both rural and urban public transportation programmes, in addition to the capital assistance program for the elderly and for persons with disabilities. This Bureau is organised into seven sections, each addressing a separate functional area: Administration, Special Programs, Public Transportation, Rail Programs, Safety Programs, Financial Management and Intelligent Transportation Systems. Arizona DOT has completely revamped its institutional structure and now has an Intermodal Transportation Division that is responsible for its long-range and short-range plans. In 2004, it created new divisions in order to provide a greater emphasis on public transit and public involvement. Colorado DOT's Division of Transportation Development has grown considerably and now contains an intermodal planning branch that includes transit, bike/pedestrian and Transportation Demand Management (TDM) units. Greatly expanded freight planning activities are conducted within both the intermodal planning and information management branches while aviation planning is handled within the Division of Aeronautics. Underscoring increasing interest in freight intermodalism, Colorado DOT created a Statewide Freight Advisory Council in 2003, composed of freight industry representatives – carriers, shippers, terminal directors, transportation officials and other experts in freight transportation – to provide advice on freight issues in Colorado. Florida DOT has a Public Transportation Administrator that manages department involvement in intermodal transportation, including Rail, Transit, Aviation and Seaport Offices. Louisiana DOT has an Office of Public Works and Intermodal Transportation that

includes Aviation, Public Transportation and Marine and Rail Transportation sections. Mississippi DOT has an Office of Intermodal Planning that is composed of the Aeronautics, Planning, Public Transit, Rails and Ports and Waterways Divisions. Texas DOT has five components contributing to the development of its statewide intermodal plan, including a Multimodal Planning team that provides technical guidance and departmental expertise.

A review of statewide plans reveals that each of these state DOTs has produced long-range, short-range and specialised plans that increasingly reflect an intermodal orientation. For instance, there is much more focus on alternative modes and discussion of broader economic, environmental and equity concerns within the later long-range plans than the ones produced in earlier periods. Elements of long-range plans in Colorado, Florida, Arizona and Louisiana were cited by a FHWA study as denoting best practices (Noerager and Lyons, 2002). An increasing number of more specialised plans focusing on intermodal issues and projects is also evident.

As one example, Colorado DOT's 2002 *Eastern Colorado Mobility Study* evaluated the feasibility of improving transportation corridors and intermodal facilities to enhance the mobility of freight services in and through the eastern region of the state. This study recommended numerous improvements to the intermodal freight infrastructure in eastern Colorado in order to facilitate future goods movement as part of the Ports-to-Plains Corridor from Texas to Colorado. CDOT has been working with the DOTs from Texas, Oklahoma and New Mexico on the Ports-to-Plains Corridor study and has worked with the DOTs from Nebraska and South Dakota on the Heartland Express corridor. In 2005, the CDOT, in conjunction with the Burlington Northern-Santa Fe Railroad and the Union Pacific Railroad, conducted a Public Benefits and Costs study to determine the feasibility of relocating some freight rail infrastructure to locations east of the Denver metro area, thereby relieving congestion on rail lines through Denver.

Additionally, Table 1 shows there is a certain degree of similarity across the states in regards to the dimensions assessed in this study. There is little variability in the quantitative results given most state DOT efforts in intermodal planning, as scores ranged from 2 (to a little degree) to just over 3 (to some degree). The ratings for assessing the overall performance in intermodal planning ranged from a high of 3.22 for Florida to a low of 2.10 in Arizona.

All state DOTs received relatively high scores (between 3, or 'to some degree' and 4, 'to a great degree') with regard to: public involvement (except Mississippi with a score of 2.73) investment in roadway construction (Alabama received a very high score of 4.12) and investment in safety improvements. The lowest rated categories across the seven states were: state DOT support for staff training, adequate state funding for intermodal projects, investment in transit and bus service, investment in bicycle and pedestrian facilities and investment in intermodal connecting facilities.

Among this sample of seven state DOTs, results indicated that Florida and Louisiana generally received higher ratings across-the-board than the others. Florida received scores over 3.0 in 16 of the 25 categories, while Louisiana had scores over 3.0 in 4 of the 25 categories, including an overall rating of 3.12. In 20 of the 25 categories, Florida had the highest score among the seven states, while Alabama had the lowest score in 12 categories. There were a few categories in which some notable differences were apparent. Florida received a score of 3.39 in espousing an intermodal vision, while Alabama's score was only 2.25. Concerning coordination between the state DOT and MPOs, Colorado (2.76) and Mississippi (2.84) had lower scores than the other states,

especially Florida (3.66) and Arizona (3.52) which scored highest on this dimension. This result was corroborated by some of the qualitative comments, especially from Colorado and Arizona. Regarding coordination between the state DOT and rural planning organisations, Alabama (2.48) and Mississippi (2.44) were by far the lowest rated states, with Arizona receiving a high score of 3.54.

**Table 1** Survey results for intermodal planning assessment

	<i>AZ</i>	<i>CO</i>	<i>TX</i>	<i>AL</i>	<i>FL</i>	<i>LA</i>	<i>MS</i>
1 Espouse an intermodal vision	2.85	2.85	2.83	2.25	3.39	3.30	2.97
2 Support intermodal projects	2.78	2.79	2.80	2.58	3.25	3.17	3.07
3 Provide support for planning	2.56	2.64	2.76	2.50	3.19	2.91	3.00
4 Consider all alternatives	2.63	2.60	2.70	2.37	3.07	2.91	2.83
5 Use planning analysis	2.52	2.64	2.54	2.48	3.15	3.00	2.86
6 Public involvement	3.15	3.10	3.17	3.04	3.33	3.09	2.73
7 Intermodal planning	2.62	2.60	2.59	2.33	2.99	2.91	2.73
8 Staff training	2.44	2.47	2.40	2.59	2.71	2.59	2.46
9 Sufficient resources for planning	2.30	2.39	2.55	2.35	2.74	2.64	2.43
10 Ensure adequate state funding	2.23	2.20	2.41	2.22	2.91	2.83	2.57
11 Ensure adequate fed funding	2.63	2.40	2.64	2.58	2.79	3.04	2.59
12 Flexible use of funds	3.00	2.54	2.91	2.48	2.87	3.00	2.62
13 Ensure state meets legis intent	2.74	2.63	2.70	2.52	3.12	3.00	2.79
14 Good communication in state	2.96	2.68	3.11	2.74	3.30	3.26	2.83
15 Coordination between state and MPOs	3.52	2.76	3.35	3.22	3.66	3.35	2.84
16 Coordination between state and Rural	3.54	2.71	2.68	2.48	3.01	2.86	2.44
17 Coordination between state and transit	3.00	2.89	2.98	2.48	3.31	3.09	2.93
18 Coordination between state and freight	2.92	2.71	2.38	2.56	3.03	3.00	2.82
19 Coordination between state and intermodal	2.84	2.55	2.70	2.36	3.12	2.91	2.76
20 Investment in road Construction	3.67	3.65	3.83	4.12	3.53	3.48	3.63
21 Investment in safety improvements	3.73	3.38	3.67	3.61	3.44	3.17	3.20
22 Investment in bus and transit	2.37	1.90	2.40	1.91	2.72	2.39	2.38
23 Investment in pedestrian	2.44	2.13	2.35	2.29	2.80	2.14	2.10
24 Investment in intermodal	2.44	2.29	2.32	2.21	2.69	2.48	2.23
25 Overall rating	2.10	2.53	2.56	2.63	3.22	3.12	2.87

*Ratings key*

1 = not at all

2 = to a little degree

3 = to some degree

4 = to a great degree

5 = to a very great degree.

Survey respondents identified the best intermodal projects in each state, as follows:

*Alabama*

- Expansion of multimodal capabilities at the Port of Mobile
- GM&O restoration/creation of intermodal facility.

*Arizona*

- HOV system with its lanes, ramps and 'park and ride' facilities
- Transit system in the Phoenix metropolitan area.

*Colorado*

- TRansportation EXpansion (T-REX) project in Denver that includes widening Interstate 25 and constructing a new light rail line in the corridor
- Denver current and future light rail projects
- Denver Union Station Redevelopment.

*Florida*

- Miami Intermodal Centre
- High speed rail initiative from Miami to Orlando
- Orlando International Airport
- New LYNX station in downtown Orlando
- Disney World transportation system.

*Louisiana*

- Port of New Orleans containerisation shipment project
- New Orleans-Napoleon Avenue wharfs and roads.

*Mississippi*

- Railroad depot restoration in Jackson and Meridian
- Intermodal connector improvement program.

*Texas*

- Trans-Texas Corridor Project
- DART's light rail system through Dallas and the Trinity Railway Express connecting Fort Worth and Dallas
- Barbours Cut project in Houston.

Respondents tended to rate these intermodal projects quite high (Table 2). They felt that the projects increased mobility and provided more connectivity. Respondents from the Western states were much more likely to say these projects increased energy efficiency and increased environmental benefits to a fairly great degree (all scores between 3.5 and 4.0), than those from the Southeastern states. Alabama scored

particularly low on these issues. Respondents generally felt that these projects helped to reduce congestion to a slightly lesser degree. Other major differences in responses across the states were that respondents in Colorado (3.48) and Texas (3.27) felt that the state DOT championed the best intermodal projects to a higher degree than did those in Arizona (2.68). However, two Southeastern states – Florida (3.78) and Louisiana (4.08) – most strongly felt their state DOTs to be the leading advocates of these projects. Also, the state DOTs in Colorado (3.57), Texas (3.44) and by far Louisiana (4.00) were judged to have provided more leadership on intermodal projects than for the other states. In most of the other categories, the results were relatively similar across the states, although Alabama tended to be lowest in general.

**Table 2** Survey results for best intermodal projects

	<i>AZ</i>	<i>CO</i>	<i>TX</i>	<i>AL</i>	<i>FL</i>	<i>LA</i>	<i>MS</i>
<i>To what extent does the best intermodal project provide</i>							
29 Increased mobility	3.84	3.93	4.00	2.85	3.76	3.69	3.75
30 More connectivity	3.81	3.73	3.90	3.08	3.87	3.75	3.85
31 Increased energy efficiency	3.67	3.61	3.76	2.31	3.51	3.25	3.11
32 Increased environmental benefits	3.86	3.73	3.74	2.00	3.50	2.81	3.11
33 Reduced congestion	3.24	3.27	3.59	2.54	3.49	3.38	3.47
<i>To what extent were the following actors involved in championing the project</i>							
35 USDOT	3.00	3.54	4.20	3.17	3.05	3.08	3.18
36 State DOT	2.68	3.48	3.27	3.08	3.78	4.08	3.27
37 MPO	3.11	3.39	3.33	2.50	3.59	3.20	2.53
38 Rural planning agency	2.89	2.46	3.81	1.78	1.87	2.00	1.85
39 Transit agency	3.18	2.93	2.42	2.40	3.10	2.27	2.55
40 City or county govt	3.50	3.91	3.32	3.45	3.69	3.38	3.52
41 Private sector	3.21	3.43	3.50	2.36	3.04	3.15	2.35
42 Advocacy group	3.06	3.24	3.39	2.27	3.02	3.00	2.40
43 Other	3.31	3.60	3.78	3.80	3.42	4.33	3.11
<i>In what manner did the state DOT contribute to the project</i>							
44. Provided funding	3.18	3.39	3.64	2.73	3.72	3.92	3.10
45. Provided leadership	2.72	3.57	3.44	2.64	3.48	4.00	3.19
46. Contributed planning	2.20	2.85	2.51	2.73	3.53	3.77	3.19
47. Contributed involvement	2.67	3.03	3.00	2.27	3.29	3.23	2.67

*Ratings key*

1 = not at all

2 = to a little degree

3 = to some degree

4 = to a great degree

5 = to a very great degree.

In assessing the qualitative comments, several themes are consistent across the state DOTs. A large number of respondents bemoaned the lack of funding for intermodal projects. Several noted this deficiency was part of an overall lack of sufficient funding for transportation in their state. Many respondents claimed that the state DOTs are still largely focused on roads and that there is much less investment in transit, bicycle, pedestrian and intermodal connectors. Yet, as noted earlier, however, the comprehensive plans for these states are decidedly intermodal in approach and include a fair degree of discussion about all of the modes. These states have also conducted a number of specialised intermodal studies. But despite these intermodal visions and plans, many respondents felt that the mindset in many cases is still largely road-oriented.

If state DOTs are to become true Departments of Transportation, then they will also have to cooperate and coordinate with a variety of stakeholders, especially MPOs. In this regard there were mixed responses across the states. In Colorado and Mississippi, there were a number of comments about the lack of coordination and cooperation between the state DOT and the MPOs/rural planning groups. In Arizona and Florida, by contrast, cooperation among these groups was cited as a strength. Arizona, in particular, received very high marks in these categories, mostly as a result of their Casa Grande accords of 1999 which created an effective framework for cooperation.

## **5 Conclusions**

The conclusions of this study are best interpreted in light of the early history and background of state DOTs and the findings from our review of the literature on statewide multimodal/intermodal planning.

Research has shown that state DOTs have made significant progress in becoming more intermodal agencies and many have been cited for developing best practices in various categories of planning activities. But while organisational structures have changed to reflect this expanding role, there are questions as to whether institutional cultures have kept pace with these changes. On the one hand, an increasing number of intermodal projects have been built in virtually every state. State DOTs are adjusting to the increased role that MPOs, rural planning commissions, transit agencies, the freight industry, business interests, environmental organisations, public interest groups and the public at-large are now playing in transportation planning as the role of transportation, broadly defined, to the economy, environment and national security becomes more fully recognised.

Yet, on the other hand, research also has shown that the shift to this broader intermodal approach has not been universally embraced. Many state DOTs are still largely highway-focused since a major responsibility continues to be highway maintenance and operations. Similarly, many of these DOTs remain staffed with a large cadre of highway engineers and most funding is still directed to the highway mode. As a result, not all state DOTs have embraced an intermodal philosophy to the same degree or adopted policies that promote intermodalism; indeed, some state DOTs have lagged behind others and much remains to be done before all embrace the commitment to intermodalism that some states have already made.

Our study was designed to contribute to the stream of research on statewide intermodal planning by examining in detail the situation in several important states in two different regions of the country. We focused on the efforts of three US western state

DOTs – Arizona, Colorado and Texas – and four southeastern state DOTs – Alabama, Florida, Louisiana and Mississippi – to embrace the changes called for in ISTEA and TEA-21 through analyses of statewide plans, organisational structures and interviews/surveys culled from knowledgeable observers of the transportation planning processes in these seven states.

From an analysis of statewide comprehensive plans, it is clear that each of these states is becoming more attuned to intermodal issues. Later plans especially tend to devote greater consideration to a variety of modes, rather than just focusing on highways. There are an increasing number of intermodal projects identified in comprehensive plans and an increasing number of specific plans being produced on intermodal aspects of transportation. Each state DOT also has changed its organisational structures to reflect a more intermodal approach.

However, despite these efforts, the results of the survey show that knowledgeable respondents rated these state DOTs from a score of 2 ('to a little degree') to slightly above 3 ('to some degree') in meeting intermodal planning objectives. Even though intermodal objectives are reflected in organisational structures and long-range plans, most respondents generally felt that more could and should be done to improve intermodal planning. Perhaps predictably, a major concern focused on the lack of funding for intermodal projects, especially the degree to which ISTEA and TEA-21 ensure adequate state funding. Respondents rated investments for roads and safety fairly high (between 'to some degree' and 'to a great degree') but rated investment for transit, bicycle/pedestrian and intermodal connectors much lower. Except for Florida and Louisiana, leadership support for intermodalism and staff training were generally not rated very high. Qualitative responses suggested that highway interests remain dominant and that an intermodal mindset has not permeated the entire transportation policy community – state transportation commission, state legislature, state DOT leadership and state DOT staff – charged with transportation decision-making and planning. Intermodal planning processes generally received only average scores, except for public involvement which was rated more highly. Responses to questions about cooperation and coordination among agencies varied across the states. Respondents also identified the best intermodal projects in each state and were generally quite complimentary toward these – though it must be noted that in some cases there were few to choose from and many involved highway construction in some way or other. Nevertheless, the respondents felt that these projects increased mobility, provided more connectivity, increased energy efficiency and increased environmental benefits to a fairly great degree.

Given these results, it is important to consider more broadly why respondents from most of these states rated their DOTs as just average when it comes to intermodal planning. It should be said at the outset that geography and settlement history play a large role in explaining the differences in the extent to which states have embraced intermodalism. Most of the states that have been cited by previous research as examples of best practices in intermodal planning tend to have larger populations with relatively high population densities and a large number of metropolitan areas. Many of them also have seaports or major freight activity. Geographically large, mostly rural states with low population densities do not generally rate as high when it comes to intermodalism. These are natural conditions that tend to predispose some states over others when it comes to a broad transportation perspective.

The geography and settlement history of Alabama, Arizona, Colorado, Florida, Louisiana, Mississippi and Texas reflect some of these points. Even though each has experienced population and economic growth in recent decades and their populations are concentrated in the major metropolitan areas, they are all relatively large states in terms of geographical area and thus have large rural areas whose inhabitants are often a powerful political force. Thus, inevitably, there is a fundamental tension between the major metropolitan centres that cry out for more intermodal solutions and the rural areas throughout the state which demand improved transportation coverage. Hence, a large component of funding is necessarily tied to roads and highways. Such decisions regarding geographic resource allocations are central to the issue of the degree of progress in intermodal planning at state DOTs such as these. Florida, for example, has experienced very rapid population growth, has high population density, a large number of metropolitan areas and several ports, which seem to be natural preconditions for a more intermodal orientation. Respondents from Alabama, on the other hand, view their state DOT in quite different ways.

Nevertheless, despite geographic diversity and particular local conditions, there is no doubt that the era of intermodalism has arrived. Transportation is no longer viewed by planners and the public as simply a question of road building and maintenance. There is a broad understanding and acceptance of the need to consider environmental and social equity issues, of the difficulties in greatly expanding the existing highway system and thus, of the need to utilise the existing infrastructure more efficiently and effectively. Technology will obviously play an important role in this regard but technology will have to be harnessed to a specific vision, one that recognises the need to use each mode to the fullest possible extent for those functions which it performs best. Thus, these and all other state DOTs must continue to strive to develop an intermodal approach to planning. Although significant progress has been made across the states, more needs to be accomplished before each state has created the kind of transportation system that fully meets the needs of all its citizens.

### *5.1 Future research*

This study focused only on a specific subset of state DOTs. A nationwide study that built on this research and looked in detail at intermodal planning processes and the degree to which intermodal projects were actually implemented is highly desirable. Such a study should analyse to what extent intermodal projects identified in statewide plans actually were built and the contributions each made to economic efficiency, environmental protection and social justice. The results could serve as the basis for the creation of a national intermodal index and if repeated on a regular basis, could identify the progress that was achieved by each state.

Particular attention should be paid to the reasons why projects were not implemented, or failed to contribute the anticipated results. In this connection, such variables as the composition, background and training of the staff at state DOTs deserve analysis, as do the role of other potential barriers, such as lack of funding, institutional cultures and political considerations, ranging from the power of the highway lobby to the potential conflict between rural and urban areas. Detailed case studies of failed projects, such as Florida's plans for high-speed rail from Miami to Orlando to Tampa, as well as various central Florida light rail plans, placed within a theoretical framework would be particularly helpful in this regard.

Pressures for intermodalism are not, however, limited to the USA. Unfortunately, most studies of intermodalism have been limited to the USA and European Union. There is an urgent need for comparative analyses of the intermodal situation in many other countries. A study of comparative intermodal policies is long overdue. Moreover, in today's global economy, no country can be without an efficient and sustainable transportation system. Studies of the progress achieved thus far in selected countries and identification of barriers to further progress, thus deserve a high priority. If these barriers are to be overcome, international aid agencies, NGOs and governments in developed countries all have an important role to play in promoting intermodalism throughout the world.

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### References

- Arnold Jr., E.D., Weichmann, P.A. and Capizzano, J.A. (1999) *A Survey of Transportation Planning Practices in State Departments of Transportation*. Charlottesville, Virginia Transportation Research Council, Virginia.
- Baloffet and Associates, Inc. (1995) *Examples of Statewide Transportation Planning Practices*, Prepared for Federal Highway Administration/Federal Transit Administration, Publication No. FHWA-PD-95-018, Federal Highway Administration, Washington DC.
- Boske, L.B. (1998) *Multimodal/Intermodal Transportation in the United States, Western Europe and Latin America: Government Policies, Plans and Programs*, Lyndon B. Johnson School of Public Affairs, Policy Research Project Report 130, University of Texas, Austin, TX.
- Boske, L.B. (1999) *Case Studies of Multimodal/Intermodal Transportation Planning Methods, Funding Programs and Projects*, Lyndon B. Johnson School of Public Affairs, Policy Research Project Report 132, University of Texas, Austin, TX.
- Crain and Associates, Inc., with Pacific Consulting Group (1996) *Institutional Barriers to Intermodal Transportation Policies and Planning in Metropolitan Areas*, Transit Cooperative Research Program Report 14, Transportation Research Board, National Research Council, National Academy Press, Washington DC.
- Dempsey, P.S., Goetz, A.R. and Larson, C. (2000) *Metropolitan Planning Organizations: An Assessment of the Transportation Planning Process*, A Report to Congress, Vols. 1–3, University of Denver, Intermodal Transportation Institute and National Center for Intermodal Transportation, Denver, CO.
- Fontaine, M.D. and Miller, J.S. (2002) *Survey of Statewide Multimodal Transportation Planning Practices*, Virginia Transportation Research Council, Charlottesville, Virginia.
- Intermodal Surface Transportation Efficiency Act (ISTEA) (1991) Conference Report, H.R. Nos. 102–404, 102nd Congress, November 27.
- Kimley-Horn and Associates Inc. (1999) *Guidelines for Developing and Maintaining Successful Partnerships for Multimodal Transportation Projects*, National Cooperative Highway Research Program Report 433, Transportation Research Board, National Research Council, National Academy Press, Washington DC.

- Lipsman, M.A. and Walter, C.K. (1998) 'Response of state transportation planning programs to the intermodal surface transportation efficiency act of 1991', *Crossroads 2000 Conference*, sponsored by Iowa State University and Iowa Department of Transportation, Iowa State University, Center for Transportation Research and Education, Ames, Iowa.
- Martinez, R. (1993) 'Perspective from the office of intermodalism', *ISTEA and Intermodal Planning: Concept, Practice, Vision*, Special Report 240, Transportation Research Board, National Academy Press, Washington DC, pp.47–54.
- Noerager, K. and Lyons, W. (2002) *Evaluation of Statewide Long-Range Transportation Plans*, Prepared for: Office of Intermodal and Statewide Planning, Federal Highway Administration, US Department of Transportation, Washington DC, April.
- Peyrebrune, H.L. (2000) 'Multimodal aspects of statewide transportation planning', *National Cooperative Highway Research Program, Synthesis of Highway Practice 286*, Transportation Research Board, National Research Council, National Academy Press, Washington DC.
- Siwek and Associates, Inc. (1996) *Statewide Transportation Planning Under ISTEA: A New Framework for Decisionmaking*, Prepared for Federal Highway Administration/Federal Transit Administration, Federal Highway Administration, Washington DC.
- Slater, R.E. (1998) 'Address by the honorable Rodney E. Slater, secretary of transportation of the United States', *Proceedings of the North American Intermodal Summit*, Special Issue of *Transportation Law Journal*, Vol. 25, No. 3, pp.80–83.
- Szyliowicz, J.S. (2000) 'Intermodalism: the challenge and the promise', *Symposium on Intermodal Transportation*, Special Issue of *Transportation Law Journal*, Vol. 27, No. 3, pp.299–315.
- TransManagement Inc. (1998) *Innovative Practices for Multimodal Transportation Planning for Freight and Passengers*, National Cooperative Highway Research Program Report 404, Transportation Research Board, National Research Council, National Academy Press, Washington DC.
- Transportation Research Board (TRB) (1993) *ISTEA and Intermodal Planning: Concept, Practice, Vision*, Special Report 240, National Academy Press, Washington DC.
- Transportation Research Board (TRB) (1996) *National Conference on Intermodalism: Making the Case, Making It Happen*, New Orleans, Louisiana, December 7–9, 1994, Conference Proceedings 11, National Academy Press, Washington DC.
- Transportation Research Board (TRB) (2000) *Statewide Transportation Planning*, Transportation Research E-Circular Number E-C015, April, Transportation Research Board, National Research Council, Washington DC.

## Notes

<sup>1</sup>23 U.S.C. 134 (a) (3); 23 U.S.C. 135 (a) (3); 49 U.S.C. 5303(a)(2) (2000).

<sup>2</sup>11 plans identified intermodalism as a major issue or challenge.

## Bibliography

- Dempsey, P.S. (2000) 'The law of intermodal transportation: What it was, What it is and What it should be', *Transportation Law Journal*, Vol. 27, No. 3, (Summer), pp.367–417.
- Goetz, A.R., Dempsey, P.S. and Larson, C. (2002) 'Metropolitan planning organisations: findings and recommendations for improving transportation planning', *Publius: The Journal of Federalism*, Vol. 32, No. 1 (Winter), pp.87–105.
- Meyer, M.D. (1999) 'Statewide multimodal transportation planning', in Edwards Jr., J.D. (Ed): *Transportation Planning Handbook*, 2nd ed., Institute of Transportation Engineers, Washington DC, pp.339–368.

- Meyer, M.D. and Miller, E.J. (2001) *Urban Transportation Planning*, 2nd ed., McGraw-Hill, Boston.
- National Cooperative Highway Research Program (NCHRP) (2001) *Managing Change in State Departments of Transportation*, NCHRP Web Document 39 (Project SP20-24[14]), Transportation Research Board, National Research Council, Washington DC.
- Transportation Research Board (TRB) (1997) *Statewide Transportation Planning*, Transportation Research Circular Number 471, June, National Academy Press, Washington DC.
- Zoller, T.D. and Capizzano, J.A. (1997) *Evolution and Devolution: A National Perspective on the Changing Role of Metropolitan Planning Organisations in Areawide Intermodal Planning*, Report No. VTRC 97-R19, Virginia Transportation Research Council.