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Freight Performance Measures Guide

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Introduction

Transportation is complex, and government agencies, the private sector, and the public must work together to address problems like mobility, reliability, safety, security, infrastructure management, environmental impacts, sustainability, and economic growth.

Government agencies have traditionally been responsible for forming transportation plans that utilize goals, objectives, and project programming to systematically address these issues and others, but since the early 1990s, federal transportation legislation has, in addition, encouraged the use of performance measures to complement the planning process. The inclusion of performance measures has been helpful for providing tools that support, guide, and justify decisions made by agency planners who operate in an environment of high accountability and transparency. These conditions require objective measures that are helpful in communicating to the public and to policy-makers the course of action that will improve the movement of goods and people. Performance measures are designed to be a quantifiable tool that can determine how well a project or system is meeting defined goals and objectives. Well-developed performance measures can benefit planners by providing the information needed to make decisions. Moreover, performance measures assist an agency in communicating decisions to the public, increasing accountability to use resources where they are needed, and improving the operational condition of transportation systems. The keys to identifying a performance indicator are that it is measurable, efficient, able to be forecast, and easy to understand.

The Texas Department of Transportation (TxDOT) has partnered with metropolitan areas to support using Intelligent Transportation Systems (ITS) data in order to make real-time decisions and support performance measures for general transportation with facilities like TransGuide in San Antonio and TranStar in Houston. Now, transportation agencies are also beginning to generate planning programs specifically for goods movement, but fewer quantitative tools and data are available that supply information to assist analysts and programmers responsible for freight planning.

Realizing this shortfall, TxDOT sponsored a scoping study during fiscal year 2006 to evaluate potential freight performance measure (FPM) strategies. The Center for Transportation Research (CTR) and the Texas Transportation Institute (TTI) delivered its findings in Technical Report 0-5410-1, *Developing Freight Highway Corridor Performance Measure Strategies in*

Texas. Since the idea of FPM is a relatively new topic, one might ask, "What is FPM?" In short, FPM are quantitative or qualitative indicators that rely on data or information to describe the influence of freight on the environment, safety, or any topic like those listed above, but at the same time, the tools define the movement of freight within the transportation system. Goods movement is a broad component of transportation. FPM attempts to describe this wide-ranging area of transportation with precise feedback; however, the accuracy of FPM relies on the quality of data used to derive the measures.

To help guide the development of FPM strategies, this brief synopsis first demonstrates that the time is right for transportation agencies to start considering freight performance measures. A national emphasis and implementation of FPM has paved the way for the usage of freight indicators, which can provide useful information to transportation planners given the charge to implement FPM. In addition, this overview introduces the areas that will most likely affect the development of FPM in Texas.

The Rise of Freight Performance Measures

The concept of evaluating transportation with performance measures has gained the attention of the national transportation sector. The consensus for performance-based planning has largely been accomplished through the Transportation Research Board (TRB) and the work of one of the organization's standing committees. TRB is a member of the National Research Council and has sponsored two national conferences on performance measures to discuss the broad use of transportation performance measures and to describe how the measures can be used in transportation decision-making. The first conference, *Performance Measures to Improve Transportation Systems and Agency Operations,* was held in 2000 and included two panel sessions on FPM.[1] Four years later, the second national conference, *Performance Measures to Improve Transportation Systems,* held one breakout session on FPM.[2] During this session, research needs were identified. Those needs included an analysis of what technologies can be used to collect freight data and a study of current freight performance measures. The

[1] Transportation Research Board Conference Proceedings 26. *Performance Measures to Improve Transportation Systems and Agency Operations*. Transportation Research Board 2001. National Academy Press, Washington, D.C. Online: http://onlinepubs.trb.org/onlinepubs/conf/reports/cp_26.pdf. Accessed: November 21, 2006

[2] Transportation Research Board Conference Proceedings 36. *Performance Measures to Improve Transportation Systems.* Transportation Research Board 2005. National Academy Press, Washington, D.C. Online: http://onlinepubs.trb.org/onlinepubs/conf/CP36.pdf. Accessed: November 21, 2006

collaborative efforts of CTR and TTI consider the above research inquires in Technical Report 0-5410-1, *Developing Freight Highway Corridor Performance Measure Strategies in Texas*.

Not only has TRB sponsored these national conferences, but TRB has also established the Performance Measurement Committee to guide research on the effectiveness of performance measures in the transportation planning context. The committee website is listed in Table 2 along with other links to follow the progress of performance measures used in transportation planning. Clearly, the concept of evaluating freight performance has entered the research sector. Moreover, this concept is now being put into practice, with several transportation agencies implementing FPM strategies.

The development of freight performance measures is emerging at the local, state, and national stage with evidence of freight indicators being implemented at metropolitan planning organizations (MPOs), state departments of transportation (DOTs), and the United States DOT. Chapter 3 in 0-5410-1 describes the current status of FPM use in Texas with an emphasis on activity at the metropolitan planning organization (MPO) level and also includes a review of efforts to implement FPMs in Minnesota, New Jersey, Oregon, and California (see footnote for links to state freight and FPM plans).[3] Minnesota and New Jersey have made the most progress in using FPMs that are a component of the overall freight planning for each state. Both have defined measures and provided categories to classify the measures. These examples are descriptive of states that have detailed freight plans with goals and objectives that are evaluated based on the information derived by FPMs. Oregon does not have a comprehensive freight plan but has included FPMs in its general transportation plan. The effort in California to generate

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[3] See Barber, D., and Grobar, L. "Implementing a Statewide Goods Movement Strategy and Performance Measurement of Goods Movement in California." California State University, Long Beach; METRANS. June 29, 2001; and Booz-Allen & Hamilton Inc. Transportation System Performance Measures Compendium of Phase II Results. California Department of Transportation. June 30, 1999. Online: http://www.dot.ca.gov/hq/tsip/tspm/tspmpdf/pm6_99comp2.pdf. Accessed: July 21, 2006; and California Department of Transportation. Transportation System Performance Measures: Status and Prototype Report. October 2000. Online: http://www.dot.ca.gov/hq/tsip/tspm/reports.htm. Accessed July 21, 2006; and Fallat, G., Keir O., Joshua C., Jakub R., and Lui, R.F. "Freight Planning Support System." North Jersey Transportation Planning Authority. July 2003. Online: http://www.transportation.njit.edu/nctip/final_report/FreightPlanning.pdf. Accessed September 19, 2006; and Larson, M. C., and Berndt, M. "Freight Performance Measures: A Yardstick for Minnesota's Transportation System." Minnesota Freight Advisory Committee, Minnesota Department of Transportation. November 1999. Minnesota Department of Transportation. Minnesota Statewide Freight Plan. May 2005. Online: http://www.dot.state.mn.us/ofrw/statewidePlan.html. Accessed August 7, 2006; and Reiff, B., and Brian G. Transportation Planning Performance Measures. Oregon Department of Transportation. October 2005. Online: http://ww.oregon.gov/ODOT/TD/TP_RES/docs/Reports/PlanningPerformanceMeasures.pdf. Accessed November 16, 2005.

freight performance measures has been conducted within overall transportation planning (like in Oregon) versus establishing indicators that support freight transportation plans.

The North Central Texas Council of Governments has evaluated freight volumes in its jurisdiction by measuring trucks per day or percent of trucks in daily traffic counts, while the Minnesota Department of Transportation (MnDOT) is using FPMs to describe travel reliability, safety, and infrastructure performance.[4] The initiatives can support planning efforts or can be used to prove the capabilities of using available data to produce FPMs.

Since 2003, the Federal Highway Administration (FHWA) in consultation with the American Transportation Research Institute (ATRI) has been testing how data gathered by Global Positioning System (GPS) devices installed in commercial vehicles can be used to describe mobility and reliability on interstate corridors.[5] The efforts by the FHWA/ATRI partnership have been divided into three phases, which are summarized in Technical Report 0-5410-1. Other initiatives also continue to emerge from the U.S. DOT within the performance measures area. One example is the Integrated Corridor Management program, which is an effort to improve the performance of urban freeways by incorporating operations of various agencies responsible for managing corridor services (tolls, transit, maintenance, etc.) and providing performance information that is not disaggregated by mode.[6]

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[4] North Central Texas Council of Governments. "Freight Bottleneck Study." Presentation by Transportation Department to Truck Technical Workgroup Meeting. June 16, 2004. Online: http://www.nctcog.org/trans/goods/TruckPresentation.pdf. Accessed August 7, 2006.

[5] American Transportation Research Institute. "Developing Real-Time Performance Measures in Freight Significant Corridors." Federal Highway Administration. April 2003; and Jones, C., Murray, D., and Short, J. "Methods of Travel Time Measurement in Freight-Significant Corridors," Presented at the Transportation Research Board Annual Meeting, Washington, D.C., January 2005; and Short, J. "ATRI Perspective." Center for Transportation Research Workshop Presentation. May 12, 2006.

[6] United States Department of Transportation. "ICM Pioneer Sites." Online: http://www.its.dot.gov/icms/icms_pioneer.htm. Accessed October 23, 2006.

Dynamic Factors in Freight Performance Measures

Although FPM has been in practice for only a short time, it may undergo significant changes in the future. Three factors are identified in Technical Report 0-5410-1 that could alter the course of FPM development for TxDOT:

a) Turnaround time for information,

b) Linking intercity and urban corridors, and

c) Data and collection technologies.

One issue in the future of freight performance measures is whether the indicators will be used for real-time information sharing or for planning purposes only. At the present time, data processing limitations constrain freight data to be used for measures that provide information to planners within transportation agencies. The potential to eventually use freight data for real-time information dispersion in the future is possible especially as technology costs and processing times decrease.

Another consideration that could affect the future of freight performance measures is the effort to link intercity and urban corridors. Chapter 6 of *Developing Freight Highway Corridor Performance Measure Strategies in Texas* succinctly evaluates the differences in urban data collection programs like the Mobility Monitoring Program (MMP) and the ATRI/FHWA initiative. Currently, the MMP data does not separately calculate truck speeds, but if the program were changed to perform this function, the two programs might be more compatible. A second option would be to increase the frequency of GPS data collection when trucks enter urban areas to produce similar coverage as data collection technologies provide to the MMP. Choices made on intercity/urban performance measure strategies could alter FPM development in Texas.

Finally, freight performance measures will be only as good as the data and technologies that allow for data collection. The success of a performance measure will largely rely on the availability of data needed to derive the measure, or if data does not exist, on the ease of acquiring the data and whether the data source is sustainable. Chapter 4 of *Developing Freight Highway Corridor Performance Measure Strategies in Texas* investigates the implications of using GPS, transponders, or cell phones to gather data needed to support FPM. The selection of a technology could have the greatest impact on the execution of FPM strategies. As mentioned earlier, FHWA partnered with ATRI to use GPS data to derive reliability and mobility measures

for freight vehicles only. Although GPS was the agencies' chosen technology, transponders and cell phones have been proven to perform comparatively for freight data collection.

Technology selection is a matter of context. Table 1 provides questions that are helpful to ask when developing a performance measure and determining what data and technology will be needed to implement an FPM. The answers to each question can guide a decision-maker who wants to evaluate mobility or reliability. In Texas, the choice of using GPS, transponders, or cell phones to support FPM would be straightforward. GPS was the technology of choice for the ATRI/FHWA work, and it would be the leader in the Texas context primarily due to the assumption that trucks operating in Texas have GPS devices on board. Cell phones would be more conducive for providing freight data than transponders in the Texas case. On a national level these two technologies would be switched, because Texas does not participate in regulatory programs such as electronic clearance that would promote the use of transponders. Trucks operating on the National Highway System in Texas may be equipped with transponders; however, the roadside infrastructure in Texas needed to read transponders is not currently available. Any initiatives such as the TxTag might generate the infrastructure needed to make transponders a more viable option for collecting freight data.

Table 1. Questions to Answer in FPM Development: ATRI/FHWA Example

Question	Answer
What issue will be described through the freight performance measure?	Mobility, reliability
What parameters describe the measure?	Travel time, delay
What information is needed to calculate the parameters?	Successive location detection of a vehicle or spot location/spot speed
What technologies/data sources can provide the given information?	Transponders, cell phones, Global Positioning Systems (GPS)

Tracking the Performance of Freight Performance Measures

Using freight performance measures to assist planners in quantifying the conditions for moving goods along a corridor is a concept that has been implemented in a few states, but it is still primarily a developing concept. Tracking the progress of freight performance measures

would be beneficial for states that have started to consider how these tools may factor in freight planning initiatives. A few resources that can assist those interested in following the advancement of freight performance measures are listed in Table 2. This compilation of sources includes websites of three of the organizations mentioned repeatedly throughout this guide: ATRI, TRB, and FHWA.

Conclusion

This guide was developed to provide insight into what role FPMs have in transportation planning, which is to validate the goals and objectives decided upon by a transportation agency. Furthermore, the current state of research and practice is developed enough to provide a framework to assist transportation decision-makers responsible for implementing FPM. Last, three keys issues–performance measure scope (planning or real time), linking intercity and urban corridors, and freight data/data collection technologies–need to be monitored to ensure that FPM strategies are consistent with changes that could alter the effectiveness of any strategy. Tracking performance development through the resources provided and following local trends should promote comprehensive FPM strategies that are consistent with changes in scope and technology.

Table 2. Websites on Freight Performance Measures

Source	Link	Description
American Transportation Research Institute (ATRI)	http://www.atri-online.org	FPM initiatives are described within the Technology and Innovation section of Current Research & Research Results
TRB Performance Measurement Committee	http://www.trb-performancemeasurement.org/	
FHWA Performance Measurement Exchange	http://knowledge.fhwa.dot.gov/cops/pm.nsf/home	See Performance Measurement of Freight and Private Sector
FHWA Freight Management and Operations	http://www.ops.fhwa.dot.gov/freight/freight_analysis/index.htm	See Performance Measurement topic