



Freight System Performance Measures for the Tampa Bay Region



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This White Paper is one in a series developed as part of the Tampa Bay Regional Goods Movement Study. The purpose of this series of White Papers is to provide background and information for the freight community in the Tampa Bay Region.

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INTRODUCTION

Transportation agencies across the United States have sharpened their focus on performance measurement since Congress passed the latest surface transportation act in 2012. Moving Ahead for Progress in the 21st Century (MAP-21) elevated the role of performance measurement in transportation planning and decision-making and also emphasized freight transportation. As a result, state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) are working to develop freight performance measures.

This White Paper has several purposes. First, it introduces freight performance measurement in the context of changing state and federal priorities. Then, it describes research and experiences with freight performance measures from across the United States. It concludes by presenting a menu of potential measures and a series of steps that local, regional, and state officials in the Tampa Bay region can use to identify preferred measures that help the region advance its goals for freight movement.

Before launching into a description of freight performance measures, this White Paper describes a few definitions of key terms from the Federal Highway Administration (FHWA) that are useful context.¹

- **Performance Management:** “Performance management is the practice of setting goals and objectives; an on-going process of selecting measures, setting targets, and using measures in decision-making to achieve desired performance outcomes; and reporting results.”
- **Performance Based Planning and Programming:** “Involves using data to support long-range and short-range investment decision-making. It generally starts with a vision and goals for the transportation system, selection of performance measures, and use of data and analysis tools to inform development of investment priorities, which are then carried forward into shorter-term investment planning and programming.”
- **Performance Measure:** “A metric used to assess progress toward meeting an objective.” The Florida DOT provides the following definition in its annual performance report: “Performance measures are indicators that quantify progress towards attaining a goal, objective, or target (target being a desired level of future performance).”²

NATIONAL AND STATE FRAMEWORK FOR FREIGHT PERFORMANCE MEASUREMENT

MAP-21’s Role in Shaping Performance Measurement

MAP-21 has done more to inject performance management into transportation planning than any prior federal transportation act. MAP-21 states that “performance management will transform the Federal-aid highway program and provide a means to the most efficient investment of Federal transportation funds by refocusing on national transportation goals, increasing the accountability and transparency of the Federal-aid highway program, and improving project decision-making.” [§1203; 23 USC 150(a)]³

¹ Federal Highway Administration. Performance Based Planning and Programming Guidebook. September 2013. https://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook/page00.cfm#es.

² Florida Department of Transportation. 2013 Performance Report. 2013. <http://www.dot.state.fl.us/planning/performance/2013/2013PerformanceReport.pdf>.

³ Federal Highway Administration. Moving Ahead for Progress in the 21st Century. Accessed March 24, 2014. <https://www.fhwa.dot.gov/map21/factsheets/pm.cfm>.

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MAP-21 calls for the federal government to set goals in seven areas – safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays. The national freight goals will “improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.”⁴

MAP-21 also requires the states to set targets within each area, which will help the FHWA make progress towards its national goals. FHWA in 2014 was still writing the rules that will implement MAP-21, but states will need to coordinate with metropolitan planning organizations (MPOs) to set specific, measurable performance targets in the area of freight and report on progress towards reaching them.

Elevation of Freight Planning in MAP-21

Performance measures and freight planning will not just affect state and regional planning. MAP-21 also established several requirements for the U.S. Department of Transportation (US DOT) and the FHWA.⁵ First, USDOT is required to identify a National Freight Network and a Priority Freight Network. The National Freight Network will consist of the National Highway System, freight intermodal connectors, and the aerotropolis transportation system. The Primary Freight Network is a subset of the National Freight Network and will consist of 27,000 centerline miles of highways that are most critical to freight movement and 3,000 additional miles that are critical to future freight movement.⁶

The FHWA announced a draft Priority Freight Network in late 2013. By law, the Priority Freight Network is limited to highways. As a result, FHWA relied heavily on truck volume to identify the draft Priority Freight Network. In the Tampa Bay Region, the first draft included most of Interstates 4 and 75 in the region, plus Interstate 275 from Haines Road in St. Petersburg to Interstate 4 in Tampa.

The Primary Freight Network will likely influence several USDOT and state freight planning efforts. For example, MAP-21 requires USDOT to create a National Freight Strategic Plan in consultation with state DOTs and other stakeholders. USDOT will also need to create a freight conditions and performance report every two years. Finally, MAP-21 directs USDOT to improve data and tools for freight planning and performance measurement. The National Freight Network and Priority Freight Network are expected to influence all of these efforts to raise the level of freight planning in the United States.

In addition to the new planning requirements, MAP-21 also provides a financial incentive for state DOTs and MPOs to program freight projects. Projects that are identified in a state freight plan and improve freight movements are eligible for a higher federal share. The federal government will pay for 90 to 95 percent of eligible costs, up from 80 percent for a typical highway project. MAP-21 also makes truck parking an eligible federal expense for the first time.

These new requirements and financial incentives make it clear that the federal government is turning more attention to freight. States and regions can prepare to tap into new resources and meet new requirements by setting and applying freight performance measures.

Florida Freight Mobility and Trade Plan

The State of Florida has also taken legislative action that requires planning for freight. Florida DOT is required to establish freight policies and identify freight investments that will strengthen the state's economy. FDOT completed the Policy Element of the Florida Freight Mobility and Trade Plan in 2013 before starting to work on the Investment Element. The Legislature included several goals that it expects to accomplish through the Plan. They are closely connected to the state's goals for economic

⁴ Federal Highway Administration. Transportation Performance Management. Accessed April 16, 2014. www.fhwa.dot.gov/tpm/about/goals.cfm.

⁵ Federal Highway Administration. Moving Ahead for Progress in the 21st Century. Accessed March 24, 2014. <https://www.fhwa.dot.gov/map21/factsheets/freight.cfm>.

⁶ Federal Highway Administration. “Talking Freight: An Overview of the Draft Highway Primary Freight Network.” November 20 and December 6, 2013. Ed Strocko and Coral Torres.

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development and include increasing the flow of trade through Florida's seaports and airports, developing intermodal logistics centers in the state, developing manufacturing facilities, and reducing transportation costs through alternative energy sources. The Policy Element includes seven objectives that support the Legislature's goals:⁷

1. Capitalize on the freight transportation advantages of Florida through collaboration on economic development, trade, and logistics programs.
2. Increase operational efficiency of goods movement.
3. Minimize costs in the supply chain.
4. Align public and private efforts for trade and logistics.
5. Raise awareness and support for freight movement investments.
6. Develop a balanced transportation planning and investment model that considers and integrates all forms of transportation.
7. Transform FDOT's organization culture to include consideration of supply chain and freight movement issues.

While the Freight Mobility and Trade Plan's Policy Element included a wealth of data on recent trends, it did not explicitly define a set of system wide performance measures to track over time and apply to project selection. However, objective 7 of the Policy Element is supported by a strategy that calls for adding freight movement metrics to the FDOT performance measures.⁸ Based on the goals and objectives of the Freight Mobility and Trade Plan, the measures are likely to have a heavy emphasis on minimizing the cost of freight movement for shippers and carriers, increasing speed and efficiency of freight movement, and connecting modes.

FREIGHT PERFORMANCE MEASUREMENTS IN THE UNITED STATES

State DOTs and MPOs across the country are grappling with performance measurement. They are familiar with performance measurement in some areas, such as through the congestion management process or transit service planning. But integrating performance measurement across the areas of transportation operations, planning, programming, and evaluation means breaking new ground for many agencies. This section describes the state of freight performance measurement in the United States, examples of MPOs that have established programs to monitor freight performance and use performance data to select projects, and the challenges and lessons that Florida's transportation agencies should consider as they embark on developing their own performance measures.

2011 NCFRP Freight Performance Measures Report

The National Cooperative Freight Research Program (NCFRP) in 2011 examined the state of freight performance measurement in the United States.⁹ The NCFRP report, "Performance Measures for Freight Transportation," found that state DOTs tend to have a small number of freight performance measures and there is little consistency between states. The nascent state of freight performance measurement is probably due to the lack of federal emphasis on this area prior to MAP-21. The report offers some important insights for agencies as they prepare to meet the new federal requirements.

A key outcome of the 2011 NCFRP report is a framework for tracking and reporting freight performance. The report proposed a Freight System Report Card that would allow federal, state, and regional agencies to track and report freight performance in a consistent manner using existing data resources. The proposed measures are fairly easy for a wide range of stakeholders to understand, and they rely on

⁷ Florida DOT. Freight Policy Fact Sheet. February 20, 2014. <http://www.freightmovesflorida.com/resources-freight-infrastructure/documents>.

⁸ Florida Department of Transportation. *Florida Freight Mobility and Trade Plan*. June 2013.

⁹ National Cooperative Freight Research Program. *Performance Measures for Freight Transportation*. May 2011.

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existing sets of data. The report card format, and the measures included, reflect several key findings from successful performance measurement programs across the United States:

- They provide a snapshot of system performance, and are supported by detailed reports for users that want to “drill down.”
- They use a broad array of measures in order to reflect competing values.
- They are organized by a data architecture that includes data protocols, common definitions, taxonomies, agreed upon reporting cycles, quality control and quality improvement processes, and consensus among users on the accuracy and efficacy of the data.
- They begin with readily available data and evolve over time.
- They use existing federal data sources.
- They supplement existing public agency data sources with data from private-sector trade associations, such as the American Trucking Association.

The report’s authors considered more than 360 freight performance measures before settling on 29 for the report card. Table 1 includes only the measures that can be applied at the national, state, and regional levels. Several of the 29 measures are only relevant at the national level. Since this white paper provides direction for the Tampa Bay Region, they were left out of Table 1. Additionally, the NCFRP report used the categories listed in Table 1 to organize the measures.

Table 1 - Freight Performance Measures from 2011 NCFRP Report

Category	Measure
System Performance	Truck freight forecast.
	Trend line of top 10 highway freight bottlenecks (based on travel speed).
	Truck travel speed (average on National Highway System).
	Rate of growth in container imports/ exports.
	Class I railroad speeds.
	Rail freight market share.
System Condition	NHS pavement condition.
	NHS bridge condition.
	Condition of NHS intermodal connectors.
System Safety	Truck injury and fatal crashes.
	Highway/rail at grade crashes.
System Environmental Impacts	Freight-related greenhouse gas emissions (in the region).
	Freight-related criteria pollutant emissions.
System Investment	Investment in NHS compared to amount necessary to sustain conditions.

The report card depicts the 10-year trend, 20-year forecast, and a narrative analysis for each of the 29 measures. By looking at both trends and forecasts, the report card responds to demands from transportation decision makers for data on both leading (future) and lagging (past) performance. The authors also recommended backing up the report card with a brief summary report for each measure, and a more comprehensive report with extensive detail on methods and data sources. This three-layer approach responds to the needs of different users groups. The general public, executives, and transportation decision-makers may only focus on the report card, while transportation professionals, journalists, or anyone else needing more information can look to the summary reports or full report.

Freight Performance Measures in Peer Regions

The NCFRP report’s authors found very little consistency in the specific measures that regions and states are using. Consistency is also lacking in how performance measures are applied. Some DOTs and MPOs use performance measures to track systemwide performance and progress towards attaining goals, which is consistent with the U.S. Government Accountability Office’s definition of performance measurement, while others use measures to select projects or evaluate projects after they are implemented.¹⁰ This section describes two peer regions – North Jersey and Puget Sound – that are using freight performance measures more for the latter purposes.

North Jersey

The North Jersey Transportation Planning Authority (TPA) has identified nearly 40 performance measures that are aligned with the agency’s six goals expressed in its long-range transportation plan. The agency started with more than 300 measures that it paired down through a screening process that eliminated redundancies and involved stakeholders to identify the measures that are most relevant to the region’s transportation goals. Finally, the agency considered the availability of data, ease of collecting data, and the complexity of the measure in making its final selections.¹¹

The measures are ultimately used to evaluate projects. Not every measure specifically captures the project’s impact on freight transportation. Rather, the freight project’s impact on the measure is taken into consideration in programming decisions. For example, the MPO examines how a freight project will affect noise and vibrations, and water quality. Other measures provide specific information on how the project will affect the efficiency of freight transportation. For example, “ton hours of delay” and “percent of ton hours traveled under congested conditions” illustrate how a project affects freight movement. Once a project is identified as a “freight rail” or “freight roadway” project, the measures in Table 2 are applied in evaluating it.¹²

Table 2 - North Jersey Performance Measures Applied to Freight Projects

Category	Measure
Environment	Emissions of Clean Air Act criteria pollutants
	Transportation-related noise and vibrations at sensitive receptors
	Quality of wetlands, surface water, and drinking water
	Impacts on Section 4(f) protected land
	Visual aesthetics of the built environment
User Responsiveness	Access to trading partners (using travel time on the highway and rail network from North Jersey to other regions that are major trading partners).
	Ton miles of travel by mode
	Tons and TEUs by mode
	Customer satisfaction (based on surveys of freight rail customers and users, truck drivers, and trucking companies).
Economy	Operating costs (highway only)
	Accident reduction (highway only)
	Travel time savings (highway only)
	Regional market share of imports and exports (rail only)
	Return on investment (highway only)

¹⁰ United States Government Accountability Office. “Performance Measurement and Evaluation: Definitions and Relationships.” May 2011. <http://www.gao.gov/products/GAO-11-646SP>.

¹¹ North Jersey Transportation Planning Authority. *Performance Results: Assessing the Impacts of Implemented Transportation Projects*. December 2011.

¹² North Jersey Transportation Planning Authority. *Performance Results: Assessing the Impact s of Implemented Transportation Projects, Guidebook for Project Performance Measurement*. December 2011.

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Category	Measure
	Cost effectiveness
System Coordination	Travel time reliability
	Ton hours of delay
	Ratio of non-recurring delay to total delay (highway only)
	Network connectivity and continuity by mode
	Percent of ton hours traveled under congested conditions (highway only)
Repair/Maintenance/Safety/ Security	Crashes/crash rates
	Transportation resiliency (protection, prevention, redundancy, and recovery measures)
Land Use/Transportation Coordination	Population and employment density (highway only)

While the North Jersey TPA has used these measures to evaluate the effects of specific projects after their implementation, several could also be used to track overall system-level performance and identify deficiencies, which is the more common use of performance measures so far in the United States. However, it is not clear how the TPA uses these measures to proactively identify freight needs and projects. Another important takeaway is that North Jersey TPA uses several qualitative measures in order to “convey the full range of a project’s impact.”¹³

Seattle

The Puget Sound Regional Council (PSRC) is the metropolitan planning organization for the Seattle, Washington region. The PSRC and the Washington Department of Transportation (WDOT) are among the nation’s leaders in freight performance measurement. The MPO uses freight-related data, collected through its Congestion Management Process, to monitor system performance and evaluate potential projects. These data capture the performance of truck freight on the region’s highway system. Among the data that PSRC collects are truck volume by time of day and direction, and truck speed. Washington DOT is also a rich sources of data. The agency is a national leader in the emerging area of using GPS data for freight performance measurement.

The basis for the MPO’s performance measurement and project selection are its multi-county transportation policies, which are agreed upon by the region’s four counties. The MPO specifically called out freight in three policies:

- Ensure the freight system meets the needs of global gateways, producer needs within the state and region, and regional and local distribution.
- Maintain and improve the existing multimodal freight transportation system in the region to increase reliability and efficiency and to prevent degradation of freight mobility.
- Coordinate regional planning with railroad capacity expansion plans and support capacity expansion that is compatible with state, regional, and local plans.¹⁴

The MPO also includes freight as one of its nine project prioritization categories. Each project receives points in the freight category based on how well it improves freight system performance, access to freight-related areas, and improves a key freight facility. The prioritization measures are listed in Table 3, along with the number of points each measure contributes to the total freight score.¹⁵

¹³ North Jersey Transportation Planning Authority. *Performance Results: Assessing the Impacts of Implemented Transportation Projects*. December 2011.

¹⁴ Puget Sound Regional Council. *Transportation 2040 Update, Appendix C*. Accessed May 16, 2014. <http://www.psrc.org/transportation/t2040/transportation-2040-update/>.

¹⁵ Puget Sound Regional Council. *Transportation 2040 Update, Appendix P*. Accessed May 16, 2014. <http://www.psrc.org/transportation/t2040/transportation-2040-update/>.

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Table 3 - Puget Sound Regional Prioritization Measures

Category	Prioritization Measure	Possible Points
Freight System Performance	1. The project improves a facility identified as a freight bottleneck through the Washington DOT's Truck Performance Measures program or other adopted agency plan.	3
	2. The project reduces conflict between freight modes (truck and rail).	1
	3. The project reduces conflict with freight and one or more passenger modes.	1
Access to Freight-Related Areas	4. The project improves access within, or to, more than 1 Manufacturing and Industrial Center (MIC)	2
	5. Or, the project improves access within or to 1 MIC.	1
	6. The project improves access to an area identified in the Regional Freight Strategy as a freight generator.	1
Improves Key Freight-Related Facility	7. The project is on a designated T-1 or T-2 Route of the state's Freight and Goods Transportation System.	2

The two regions described in this section are among the nation's leaders in freight transportation planning, and are also among the most advanced in using performance to evaluate and select projects. While it is not clear how they are using system-level performance measures to track progress towards goals and targets, regions across the United States are already moving in that direction in anticipation of new federal rules that will implement MAP-21.

Challenges

The most common challenges regions will face, and some lessons learned from DOTs and MPOs that have already developed performance measures, are described in this section, which draws heavily on the findings of the 2011 NCFRP report previously cited.

- Setting Freight Goals** – Goals and objectives give meaning to performance measures. Goals indicate what is important and should be measured. Objectives indicate the direction in which performance should move (more, less, higher, lower, etc.). Performance measures help agencies evaluate goals and objectives and select improvement projects or programs that will help the agency achieve them. Freight transportation is different from personal transportation in some important ways that present challenges to setting goals and objectives. First, freight is carried mostly by private for-profit companies that are likely to have very different goals than government agencies. While the private sector needs to focus on making a profit, reliability, and efficiency; the government agencies are focused more on externalities such as congestion, safety, and air pollution. Conflicting priorities make it important for transportation agencies to involve many different stakeholders from different perspectives in order to find shared interests. FDOT's outreach for the Freight Mobility and Trade Plan is a good example.
- Lack of Consistency** – Freight performance measurement is an evolving area. As such, state DOTs and MPOs have largely developed their own freight performance measures based on existing data and goals. No set of universally-shared freight performance measures has emerged. In addition to the inconsistency between different agencies and states, there can also be inconsistency between data sets that can support freight performance measurement. Two cities,

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counties, regions, or states may collect similar data (such as pavement condition) using different technology and methods, which makes comparisons difficult.

- **Abundance of Incomplete Data** –The amount of data available for performance measurement is greater than ever. Especially abundant are data on the condition of infrastructure and general travel data aggregated from all modes. Data that specifically address freight are less abundant. Many transportation agencies study general performance on key freight corridors as a proxy for measuring the movement of goods. Fortunately, more data on freight transportation are coming available due to a partnership between the FHWA and the American Transportation Research Institute (ATRI), which is providing truck volume and speed data collected through a sample of global positioning systems (GPS) transmissions. However, even this robust data set is incomplete. The sample is drawn mostly from large national trucking firms and independent truckers, which means that data may be less reliable for important last mile connections.¹⁶
- **Freight Modeling Capabilities at the Regional Scale** – Another challenge is modeling the effects of different transportation improvements on freight performance. Many regions have truck forecasting models developed from a patchwork of data. They typically do not cover all modes of freight and are incapable of modeling how different improvements or changing economic, demographic, or land use conditions might change freight mode share. The Tampa Bay Regional Planning Model has a freight component that Florida DOT District 7 has improved to better estimate truck travel. Additionally, freight transportation covers long distances, sometimes stretching the entire continent. Even a strong regional truck model will struggle to capture freight that is simply passing through the region.
- **Applying the Measures** – Most of the agencies that reported using freight performance measures in the 2011 national report did not rely on the measures to guide decisions. They are more likely to use freight performance measures as indicators. They told the transportation agencies and general public how freight – typically truck freight – was moving in the region, but they were not well connected to decision-making processes or to amend goals and objectives.¹⁷

Lessons Learned

The research on freight performance measurement in the United States also reveals some key lessons for agencies in the Tampa Bay region and others attempting to develop performance measures.

- **Establish Goals and Objectives** – Measures lack meaning in the absence of goals and objectives. Performance measures should clearly communicate how the transportation system is functioning relative to stated goals and objectives. The measures can also help an agency make investment decisions and adjust its goals and objectives in response to changing policies, conditions, or data availability.
- **Involve Public and Private Stakeholders** – Public and private stakeholders in the areas of freight transportation may have conflicting goals and objectives, or they may simply be concerned with different aspects of performance. Public and private stakeholders also depend on each other. Freight is carried largely by private companies. Therefore, public agencies depend on private carriers for much of the data used to track performance. The private sector and all levels

¹⁶ Liao, Chen-Fu. *Using Truck GPS Data for Freight Performance Analysis in the Twin Cities Metro Area*. University of Minnesota. March 2014.

¹⁷ National Cooperative Freight Research Program. *Performance Measures for Freight Transportation*. May 2011.

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of government should also be involved in selecting measures because they all share responsibility for improving freight infrastructure.

- **Start Small and Build** – Agencies should start small with performance measures. The transportation industry is awash in data and agencies may be tempted to track as many measures as possible in their first attempt. But at first, agencies should keep performance measurement simple and use the data that is easiest to collect and process. Each year the agency can evaluate its measures and adjust them or add new ones to reflect the agency's needs and goals. Agencies will likely find that they would like to move from lagging indicators (those relying on data from past performance) to leading indicators (that predict future performance).
- **Use Existing Data Resources** – In the interest of time and money, agencies should start out using existing data resources. They should evaluate these data based on how easy they are to access, their accuracy, age, and cost. Only if existing data are insufficient should an agency collect or purchase additional data to supplement what it has. In working with data, agencies should have clear rules that regulate how data are collected, stored, maintained, and manipulated.¹⁸

TAMPA BAY REGIONAL CONSIDERATIONS

The previous section provides transportation agencies in the Tampa Bay region with some general guidance for establishing performance measures. But each region is unique, and the ultimate performance measures used by transportation agencies should reflect the local geography, infrastructure, and economy. For example, some regions are on the coast and handle a large amount of waterborne cargo. Others are home to businesses engaged in resource extraction and handle a large amount of natural resources via rail. Meanwhile, others have large-scale logistics hubs that receive and distribute goods throughout a broader region or the country. The Tampa Bay region is engaged in each of the types of freight transportation. It is important to consider this local context before setting performance measures.

Regional Freight Trends

The volume of freight carried in the Tampa Bay Region will continue growing for the foreseeable future. About 1.9 billion tons of freight moved to, from, and within Florida's borders in 2009. That figure is expected to increase to about 3.2 billion tons by 2040. Several factors are driving the growth of freight transportation in the region. The major ones are highlighted here.¹⁹

- **State and Regional Growth** – Florida is a growing state and the Southeast continues to see a large influx of people from other regions of the United States. Population growth will create additional demand for consumer goods that arrive by trucks, trains, planes, and ships.
- **Interstate 4 Distribution Hub** – Port and rail infrastructure in Hillsborough County have made it an important freight hub for the region. Polk County has also emerged as a key freight center as the state has grown and Interstate 4 is playing a more important role connecting Tampa Bay with Central Florida. The CSX Integrated Logistics Center in Winter Haven, will be one of the state's largest intermodal distribution centers. Capacity along this corridor will be very important for freight mobility.

¹⁸ National Cooperative Freight Research Program. *Performance Measures for Freight Transportation*. May 2011.

¹⁹ Tampa Bay Regional Strategic Freight Plan. July 2012.

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- **Panama Canal Expansion** – The Panama Canal expansion will allow larger ships to travel from Asia to the Eastern Seaboard. This will likely mean increased traffic at the Port Tampa Bay and Port Manatee. Last mile access for trucks will grow in importance.
- **Trade with Latin America** – The economy of Latin America has been growing rapidly in recent years. Florida is well situated to benefit from the growth. The state is already Brazil's largest trading partner in the United States. Additionally, free trade with Cuba could lead to a significant increase in trade at the region's ports.

Existing Goals and Objectives Related to Freight

As described in the Lessons Learned section, regional goals and objectives are necessary prerequisites to performance measures. FDOT Districts 1 and 7 collaborated in 2012 to create the Tampa Bay Regional Strategic Freight Plan, which lays out a framework of objectives that can guide the selection of performance measures. The Plan's overarching goal is to provide a safe, secure, effective, and efficient freight transportation system that fosters the economic vitality and livability of the Tampa Bay region.²⁰ This broad goal is supported by eight objectives, listed in Table 4 below, and specific investment priorities. The region's Goods Movement Advisory Committee (GMAC) developed these objectives. The GMAC consists of city, state, and county governments responsible for implementing transportation projects; metropolitan planning organizations; private freight carriers, ports and airports; economic development and planning agencies; private shippers; and the University of South Florida Center for Urban Transportation Research.

Table 4 - Existing Regional Freight Objectives from Tampa Bay Regional Strategic Freight Plan

Objective Category	Objective
Freight Mobility	Improve safety conditions on the freight transportation system.
	Improve accessibility and connectivity for freight transport to designated freight activity centers.
	Improve mobility conditions and the overall performance of the freight transportation system.
	Improve the security of the freight transportation system for efficient and reliable goods movement.
Freight Compatibility	Improve safety, accessibility, and mobility conditions where the freight and passenger transportation systems interact.
	Improve protection and mitigation for communities, neighborhoods, and natural resources, which are impacted by the freight transportation system.
	Improve the freight transportation system's contribution to the economic competitiveness of the region and its communities.
	Implement regional and local coordination of plans and policies that encourage an integrated approach to freight and livability issues.

The objectives listed in Table 4 emphasize safety, security, and efficient movement. But they also recognized that freight is just one part of the broader transportation system. Therefore, the freight compatibility measures call for making sure the transportation system is balance between the needs to move people and goods, and that local governments and planning agencies collaborate in their planning.

Existing Measures or Indicators

The Regional Strategic Freight Plan takes a step in the direction of performance measurement by using indicators to identify the most pressing corridor and intersection needs. These indicators are aimed at

²⁰ Tampa Bay Regional Strategic Freight Plan. 2012.

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specific locations. As such, they are not regional system-level performance measures, although some could easily be applied at a greater scale. Several of the indicators are listed in Table 5 below.

Table 5 - Performance Indicators from Regional Strategic Freight Plan

Objective Category	Performance Indicator
Freight Mobility	Number of crashes involving trucks.
	Ratio of percent crashes involving trucks TO percent truck traffic.
	Ratio of future congested speed TO free flow speed.
	Annual truck delay (at "hot spot" locations).
	Future Average Annual Daily Truck Traffic (AADTT).
	Future average percent truck traffic.
	Existing volume-to-capacity ratio on the freight network.
	Future industrial employment served within ¼ mile of project.
Freight Compatibility	Existing average percent truck traffic.
	Existing industrial and commercial employment served within ¼ mile of project.

Responsibility for Programming Freight Projects

The ultimate purpose of performance measurement is to improve the transportation system. Measures help improve system performance by influencing investment and operational decisions. These decisions are made at every level of government and in the private sector. Therefore, all partners must also share in the responsibility of selecting and applying performance measures. This does not mean that each entity uses the exact same set of measures in its day-to-day business. But having a set of universal measures to evaluate improvements is in the entire region's interest.

Additionally, when selecting performance measures government agencies should consider their ability to improve infrastructure for each mode. Measures are especially useful when they help governments identify transportation projects or operations changes that will improve performance. Local governments, MPOs, and DOTs have the greatest influence on the roads and highways. But this does not mean they should not measure freight rail performance. A comprehensive set of measures provides a complete picture of freight transportation and can also be useful for private stakeholders.

ASSESSMENT OF POTENTIAL MEASURES FOR TAMPA BAY

Menu of Potential Measures

This section is a starting point for freight performance measurement in the Tampa Bay Region. Ultimately the local, regional, state, and private partners should come together to identify a small set of measures to track over time. This responsibility could fall to an existing group, such as the Goods Movement Advisory Committee. Table 6 presents all of the potential measures along with a simple evaluation based on criteria developed by Schofield and Harrison in 2007 and described in the 2011 NCFRP report.^{21 22} The evaluation helps clarify the tradeoffs that come with each measure. Each measure in Table 6 is evaluated against five criteria on a low-medium-high scale. The criteria include:

- **Understandable** – How well can a non-technical audience understand the measure?
- **Useful** – How well does the measure help an agency track progress towards goals and targets?
- **Forecast Potential** – How well can the measure be forecast into the future?
- **Ease of Data Collection** – Are the data easy to collect with low investment of effort and time?

²¹ Schofield, Mike and Robert Harrison. *Developing Appropriate Freight Performance Measures for Emerging Users*. Southwest Region University Transportation Center. September 2007.

²² National Cooperative Freight Research Program. *Performance Measures for Freight Transportation*. May 2011.

Freight System Performance Measures for the Tampa Bay Region

- **Data Quality** – How accurate, reliable, and timely are the data?

The evaluations reveal that safety data are fairly easy to access and the quality is high. State and federal transportation agencies place a high value on safety and collect robust data to track performance over time. Safety data are not perfect, and there are discrepancies in how crashes are reported from jurisdiction to jurisdiction, but they are still among the most accessible. Economic data, such as jobs by industry, and the value of imports and exports, are also fairly easy to access. Data on the movements of freight are less easy to access and data quality is generally worse than the other measures. These data must be collected through counts or technology such as GPS, which require more time and effort to collect, manage, and process. It is especially difficult to access data on the movement of freight that travels by multiple modes. These data are collected by many private companies that track packages or shipments from mode-to-mode, but they are not commonly used in freight planning.²³

The measures also vary substantially in how easy they are to understand. Some common measures, such as travel time index or reliability index, can be difficult for the general public to understand, even though they may have very high value to transportation officials. Data on emissions also require substantial investments of time and resources in modeling, which can also be difficult for a general audience to comprehend. The measures also vary according to whether they can be observed, modeled, or both. Many measures can be readily observed in the field to identify current performance. For these measures, time series evaluation can be done to indicate improving or deteriorating performance. These would include crash statistics and current vehicle movements. Some measures can be used to forecast future conditions. For example, there are established methods and data sets used to forecast traffic volumes. The relationships between population, employment, and travel demand are can be modeled. As a result, these data can be estimated for the future, in addition to tracking trends over time. These so-called “leading” indicators are highly valued by transportation planners. Perhaps the most important criterion though is usefulness. A good performance measure helps agencies understand if performance is moving towards their goals.

The color coding of Table 6 can help transportation agencies identify measures that are easier to use in the near term. Green shading indicates that the measures performs fairly well in the criterion, while red indicates possible obstacles to using the measure. The measures with more green boxes are likely the easiest to start with, while those with more red boxes may require significant investments in time and resources. Table 6 also includes a set of recommended measures, highlighted in bold, that generally scored well in the evaluation. While the region’s transportation agencies must ultimately decide on a set of measures, the recommended measures are likely easier to use in the near term because they are understandable by a wide audience and the data are readily available, although substantial processing and storage are necessary for some.

²³ National Cooperative Freight Research Program. *Performance Measures for Freight Transportation*. May 2011.

Freight System Performance Measures for the Tampa Bay Region

Table 6 - Assessment of Recommended and Potential Freight Performance Measures for the Tampa Bay Region

Measure (recommended in bold)	Scale (system or corridor)	Understand -able	Useful	Forecast Potential	Ease of Data Collection	Data Quality	Data Sources
Safety Measures							
Truck crashes per truck VMT	Both	Med	Med	Low	Med	Med	FDOT Data, Model
% of truck crashes involving an injury	Both	High	High	Low	High	High	FDOT Data
% of truck crashes involving a fatality	System	High	High	Low	High	High	FDOT Data
Highway/rail at-grade crashes	Both	High	Med	Low	High	High	FRA
Truck crashes	Both	High	Med	Low	High	High	FDOT Data
Truck crash injuries	Both	High	Med	Low	High	High	FDOT Data
Truck crash fatalities	Both	High	Med	Low	High	High	FDOT Data
Total rail accidents	System	High	Med	Low	High	High	FRA
% of rail accidents involving a fatality	System	High	High	Low	High	High	FRA
Highway/rail at-grade crash injuries	Both	High	Med	Low	High	High	FRA
Highway/rail at-grade crash fatalities	System	High	Med	Low	High	High	FRA
Access Measures							
Average truck delay at ports	Corridor	High	High	Med	Med	Med	ATRI GPS, Port Authorities
Truck delay on key access routes to freight activity centers	Corridor	Med	High	Med	Med	High	ATRI GPS
Volume-to-capacity ratio on freight distribution routes	Corridor	Med	Med	High	Med	Med	FDOT Data, Model
Volume-to-capacity ratio on freight activity center streets	Corridor	Med	Med	High	Med	Med	FDOT Data, Model
Mobility Measures							
Point-to-point travel times on key freight highway network segments	Corridor	High	High	Med	Med	High	ATRI GPS
Truck delay per year at top 10 highway bottlenecks	Both	Med	High	Med	Med	High	ATRI GPS, Field Observation, Model
Truck Reliability Index in AM Peak (80th percentile travel time/target travel time)	Corridor	Low	High	Low	Low	High	ATRI GPS
Truck Reliability Index in PM Peak (80th percentile travel time/target travel time)	Corridor	Low	High	Low	Low	High	ATRI GPS
Truck VMT	System	Med	Low	High	Med	Med	Model
Truck Travel Time Index on Interstate	Corridor	Low	High	Med	Med	High	Model, ATRI

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Highways							GPS
Volume-to-capacity ratio on freight network	Corridor	Med	Med	High	Med	Med	FDOT Data, Model
Average Class 1 railroad speed	Both	High	Med	Low	Low	High	Railroads
Rail market share for freight tonnage	System	Med	Med	Med	Med	Med	FAF
Trucks as a percent of total traffic volume	Both	High	Med	High	Med	Med	Model, Counts
Condition Measures							
Pavement condition of freight network	Both	High	Med	Med	Med	High	HPMS
Bridge condition of freight network	Both	High	Med	Med	High	High	HPMS
Livability Measures							
Freight-related criteria pollutant emissions	System	Med	High	High	Low	Med	Model, MOVES
Freight-related greenhouse gas emissions	System	Med	Med	High	Low	Med	Model, MOVES
Economic Measures							
Freight transportation employment	System	High	Med	Med	Low	High	BLS
Tons of imports and exports by water	System	High	Med	Med	Med	High	BTS
Tons of imports and exports by air	System	High	Med	Med	Med	High	BTS
Tons of imports and exports by pipeline	System	High	Low	Med	Low	High	
Tons of imports and exports by truck	System	High	Med	Med	Med	Med	FAF
Tons of imports and exports by rail	System	High	Med	Med	Med	Med	FAF

Existing Data Resources

Measures should be driven by goals and what is important to decision makers. But existing data limit the possible measures. Local governments, MPOs, and FDOT simply cannot track what they cannot measure. Several of the measures listed in Table 6 can easily be calculated using existing data sources. Others will require a greater investment of time to gather and transform data into a meaningful measure. Meanwhile others, such as those using GPS data, rely on readily available data that requires extensive processing in order to tell a coherent story. Several data sets at the national, state, and regional level can feed the measures. Some of the common data sets are summarized here.

- **Commodity Flow Survey** – This is a national sample of the shipments of 100,000 businesses nationally. It can be used to estimate freight flows between regions. However, since it comprises a small sample of businesses, there is a high level of potential error associated with the data.
- **Rail Waybills** – The federal Surface Transportation Board provides a sample of railroad waybills for public use that includes data about the origin and destination of freight, the types of commodities shipped, and rail volume.
- **Freight Analysis Framework (FAF)** – The FAF uses the Commodity Flow Survey data to create a comprehensive picture of freight movements that includes estimates of tonnage, value, domestic ton-miles by region of origin and destination, commodity type, and mode for 2007 and forecasts through 2040. As noted under the Commodity Flow Survey, care needs to be taken not to assume too much precision the results of FAF.
- **Fatality Analysis Reporting System (FARS)** – The National Highway Traffic Safety Administration provides data on fatal truck crashes through FARS.
- **ATRI Congestion Monitoring** – The Federal Highway Administration and American Trucking Research Institute (ATRI) have partnered to collect a sample of GPS data from hundreds of thousands of trucks across the United States. These data can be used for a variety of measures involving truck travel speed, travel time, bottlenecks, and congestion. State DOTs, university researchers, and MPOs across the country are learning how to use this rich new data set. They are developing and refining new applications that will allow transportation agencies to measure truck reliability and delay.
- **Federal Railroad Administration Office of Safety Analysis** – The FRA's Office of Safety Analysis provides data on rail crashes down to the county level through a query tool on its website.
- **Emissions** – MPOs are often capable of modeling truck travel and applying factors to estimate emissions from trucks.
- **Crashes** – State and federal agencies maintain extensive databases of crashes that describe the location of crashes, their severity, and the types of vehicles involved.

Common Data Issues

The preceding section makes it clear that there is no single resource for freight data that covers all modes. Data from many different sources must be combined in order to tell a complete story about freight. The data sources also demonstrate that the type and quality of data vary substantially from mode-

to-mode. Whereas trucks use public highways and streets, trains largely use private infrastructure. As a result, it is more difficult to collect data on the condition of rail infrastructure at the local level. Meanwhile, performance measurement for ports is limited by a lack of consistent metrics and definitions across ports. These basic characteristics of available freight data create some issues for performance measurement, such as the following:

- **Merging Data** – it is often necessary to combine data from different sources. This can be difficult because different agencies or local governments may use different definitions, data may have been collected at different times of the year, and the technology for collection may differ. For example, the different technology used to count vehicles may use different classification schemes for trucks.
- **Governing Data** –More freight data are available each year. Recently truck GPS data have become available to planners. While the additional data create opportunities, they also create new challenges to managing and processing them. Additionally, the private sector controls a lot of valuable data. Establishing relationships and contractual arrangements for sharing these data are also obstacles.
- **Quality of Freight-related Data** - The National Cooperative Freight Research Program's 2011 report on performance measures included this statement: "A primary finding is that freight performance measurement is challenged both by an abundance of data and by a lack of complete data for many important freight system performance functions." While the amount of available data continues to grow, significant gaps remain such as sufficient origin/destination data, estimates of value of cargo shipped, and network coverage. The quality of data is also affected by its age and how well it has been maintained. Data are ideally collected in a consistent manner year-after-year.
- **Quantity of Freight-related Data** – While there continue to be gaps in the available freight data, the quantity of data is growing. GPS data provided through a partnership of the FHWA and ATRI create several new possibilities, particularly with regards to truck travel speed and reliability, but they also create new challenges for management and processing.²⁴

Transportation agencies should consider these factors when selecting performance measures. Perfect measures are elusive. Measures typically include difficult tradeoffs between their predictive or descriptive usefulness, the cost and time involved in acquiring data, and the ability for citizens and elected officials to easily understand the measure's meaning.

NEXT STEPS FOR TAMPA BAY REGION

This paper has laid out some potential performance measures for the Tampa Bay Region. While several of these measures may appear useful, agencies should consider the following factors and steps before applying the performance measures presented in Table 6 to systems-level or corridor-level evaluations.

Tracking Federal Implementation of MAP-21

The Federal Highway Administration has taken the lead in implementing the freight-related requirements of MAP-21. FHWA is working in 2014 to introduce its performance measurement rules. FHWA anticipates

²⁴ National Cooperative Freight Research Program. *Performance Measures for Freight Transportation*. 2011.

that all MAP-21 performance measurement provisions will be in effect by spring 2015.²⁵ The region's MPOs and FDOT districts will be tracking these rules since they will affect any performance measurement program established at the regional and state levels.

Who Takes the Lead?

This is a key question in the Tampa Bay Region. Florida's MPO boundaries typically follow county, rather than regional, boundaries. This structure makes cooperation among MPOs especially important for creating regional performance measures. The region also has two FDOT districts. Fortunately the region has created an advisory group for freight planning. The Goods Movement Advisory Committee is a candidate for developing a set of performance measures that apply to the entire Tampa Bay Region. But this still leaves the question of who will collect, manage, and communicate the data, and how the data management will be coordinated among the various planning agencies.

Establishing Regional Goals and Objectives

This paper has stressed the importance of goals and objectives in performance measurement programs. Performance measures lack a clear purpose without them. The Tampa Bay Regional Strategic Freight Plan included eight objectives that provide a foundation for identifying appropriate performance measures. But the MPOs and FDOT have goals and objectives as well. The recommended measures may provide useful information for the objectives listed in the Tampa Bay Regional Strategic Freight Plan, but they may not resonate with each individual MPO. Each MPO may choose to supplement them with measures that are specific to their goals and objectives expressed in the long-range transportation plans. But MPOs and FDOT should strive to have consistency between the goals and objectives of the Strategic Freight Plan and the MPOs' long-range transportation plans. Close coordination is necessary for achieving consistency.

Setting Targets

Targets make goals and objectives specific. They allow transportation agencies to easily know if they are improving and when they have reached the target. Setting targets will face the same obstacles as setting goals and objectives. The MPOs may want to set different targets than the region as a whole. Navigating the relationships between FDOT, the MPOs, and the GMAC to arrive at goals, objectives, and targets will be challenging. Even without explicit targets, measuring performance over time can indicate how well certain strategies and policies are achieving plan goals and objectives.

Selecting Measures

The selection of measures flow naturally from establishing goals, objectives, and targets. The best measures are easily understood by the public, indicate progress or lack of progress towards targets, and make use of existing data to the greatest extent possible. Table 6 is a starting point. It describes several measures that could be used in the Tampa Bay Region. But the experience of other regions, and research on freight performance measures, indicate that the Tampa Bay Region should start with a much smaller set of measures that are closely linked to goals and objectives.

Connecting Measures to Project Selection

Performance measures should ultimately influence transportation project selection so that agencies' funding decisions support improved performance. In order to have this effect, transportation agencies should carefully craft their project evaluation criteria so that they will identify the best projects in light of the agency's goals and objectives.

²⁵ Federal Highway Administration. MAP-21 Implementation Schedule.
<https://www.fhwa.dot.gov/tpm/about/schedule.cfm>.

The large number of MPOs and local governments in the Tampa Bay region require a high degree of coordination to assure funding of the projects that are best aligned with regional goals and objectives. Again, strong collaboration among MPOs, the FDOT districts, and the Goods Movement Advisory Committee will be necessary for making sure that funding goes towards the freight projects that will bring the most benefits to the entire region.

CONCLUSION

Freight performance measurement is an evolving practice. Transportation planners have collected and tracked data on performance in the areas of safety and emissions for a long time. But freight performance measurement has evolved more slowly in the absence of a clear federal mandate and the challenges associated with collecting data that have been described in this paper. MAP-21 provides a fresh impetus for freight performance measurement. The next few years will likely bring many new data resources, new measures, and federal rules that strengthen the practice and bring new attention to freight performance measurement. The literature and experiences described in this report provides good advice for this environment. Start with a small set of measures, take advantage of existing data before collecting new data, and build as you go.