



Performance- Based Planning and Programming Guidebook

September 2013



U.S. Department of Transportation
Federal Highway Administration

Technical Report Documentation Page

1. Report No. FHWA-HEP-13-041	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Performance Based Planning and Programming Guidebook		5. Report Date September 2013	
		6. Performing Organization Code	
7. Authors Michael Grant (ICF), Janet D'Ignazio (ICF), Alexander Bond (ICF), Alanna McKeeman (ICF)		8. Performing Organization Report No.	
9. Performing Organization Name and Address ICF International, Inc. 9300 Lee Highway Fairfax, VA 22031		10. Work Unit No. (TRAIIS)	
		11. Contract or Grant No. DTFH61-10-D-00006	
12. Sponsoring Agency Name and Address United States Department of Transportation Federal Highway Administration 1200 New Jersey Ave. SE Washington, DC 20590		13. Type of Report and Period Covered June 2012 – October 2013	
		14. Sponsoring Agency Code HEP	
15. Supplementary Notes Mr. Egan Smith, Federal Highway Administration, COTM			
16. Abstract Performance-based planning and programming (PBPP) refers to the application of performance management principles within the planning and programming processes of transportation agencies to achieve desired performance outcomes for the multimodal transportation system. The Guidebook has been designed to help State DOTs, MPOs, RTPOs, transit agencies, and other partner organizations understand: the key elements of a PBPP process and the relationship of these elements within existing planning and programming processes. The Guidebook is designed to highlight effective practices to help transportation agencies in moving toward a performance-based approach to planning and programming.			
17. Key Words Transportation planning, performance measurement, programming, project selection, modeling, analysis methods, state DOT, metropolitan planning organization, rural transportation planning organization, transit agency		18. Distribution Statement No restrictions. This document is available to the public from the National Technical Information Service, Springfield, VA 22161.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 133	22. Price N/A

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

TABLE OF CONTENTS

Foreword/Acknowledgements	i
Executive Summary	iii
1. Purpose and Overview	1
Building on Existing Practices.....	2
Integrating Performance Management into Planning and Programming.....	5
Challenges Associated with PBPP	7
Organization and Use of this Guidebook.....	9
2. Overview of PBPP: Key Concepts	10
Why Use a Performance-Based Approach to Planning and Programming?.....	10
Terminology	12
Common Elements of PBPP	13
Common Themes within a PBPP Process.....	16
Cooperation and Coordination.....	16
Linkages across Performance-Based Planning Activities	18
Public and Stakeholder Involvement	20
Data and Tools.....	21
Feedback Mechanisms	23
3. Develop Goals and Objectives.....	24
Developing Goals: Focus on Outcomes	24
Consider Goals Broadly	28
Developing Objectives	31
Identify Focus Areas	31
A Hierarchy of Objectives: Outcomes, Outputs, Activities.....	32
Using an Objectives Decision Tree	33
Evolution of Objectives	34
Involve the Public in Developing Goals and Objectives.....	38

4.	Select Performance Measures	40
	Roles of Performance Measures.....	40
	Factors to Consider in Selecting Measures.....	41
	Building on Public Concerns.....	45
5.	Identify Trends and Targets.....	47
	Desired Trends and Numerical Targets.....	47
	Time Frames for Target Setting and Planning Analysis.....	49
	Process for Setting Targets	51
	Analyze Baseline Data and Develop Assumptions	52
	Consider Multiple Factors	52
6.	Identify Strategies and Analyze Alternatives	55
	Identify Potential Strategies and Packages of Investment Approaches.....	56
	Use Data and Analysis Tools to Inform Potential Options.....	59
	Conduct Scenario Analysis	62
7.	Develop Investment Priorities in the LRTP.....	67
	Development of the LRTP	67
	Link to Other Planning Documents.....	70
8.	Programming - Develop Investment Priorities in the TIP/STIP	72
	Linking Planning to Programming.....	72
	Developing an Investment Plan	74
	Project and Strategy Selection.....	76
	Communicating the Connections to Performance	79
9.	On-going Monitoring, Evaluating, and Performance Reporting	81
	Monitor System Performance.....	82
	Evaluate Program Effectiveness.....	84
	Report Performance Results	86
10.	Keys to Success	93
11.	Case Studies	96

Minnesota Department of Transportation	96
Southeast Michigan Council of Governments	103
Champaign Urbana Urbanized Area Transportation Study	108
Washington Metropolitan Area Transit Authority.....	113
12. Additional Resources	124
Glossary.....	124
Relevant Reference Documents.....	131

FOREWORD/ACKNOWLEDGEMENTS

This document was developed in collaboration with stakeholders across the transportation industry. It was guided by a Stakeholder Committee, which spent hours reviewing the work program, draft deliverables, and the final Guidebook. Members of the Committee were selected based on previous work in performance-based planning, previous activities with FHWA (conferences, peer exchanges, webinars), and consultation with national industry associations. The Committee included MPO, State DOT and transit agency staff members, with consideration given to geographic balance and population within the planning area. Additional members were included to represent rural transportation planning and public transportation providers. Members of the Stakeholder Committee included:

Deanna Belden	Minnesota Department of Transportation
Natalie Bettger	North Central Texas Council of Governments
Lynette Ciavarella	Illinois Regional Transportation Authority
John Crocker	Metropolitan Atlanta Rapid Transit Authority (GA)
Brian Fineman	North Jersey Transportation Planning Authority
Marsha Fiol	Virginia Department of Transportation
Amy Kessler	North Central Commission (PA)
Jane Hayse	Atlanta Regional Commission (GA)
Patricia Hendren	Washington Metropolitan Area Transit Authority (DC)
Eric Hesse	Tri-County Metropolitan Transportation District of Oregon
Brian Hoeft	Regional Transportation Commission of Southern Nevada
Charlie Howard	Puget Sound Regional Council (WA)
Chris Hundt	Michigan Department of Transportation
Dick Jarrold	Kansas City Area Transit Authority (MO/KS)
Ron Kirby	Metropolitan Washington Council of Governments
Andrew Kjellman	Regional Transportation Commission of Southern Nevada
Sandi Kohrs	Colorado Department of Transportation
Rita Morocoima-Black	Champaign County Regional Planning Commission (IL)
Scott Omer	Arizona Department of Transportation
Cory Pope	Utah Department of Transportation
Camelia Ravanbakht	Hampton Roads Transportation Planning Organization (VA)
Jim Ritzman	Pennsylvania Department of Transportation
Machelle Watkins	Missouri Department of Transportation
Lyle Wray	Capital Region Council of Governments (CT)
David Vautin	Metropolitan Transportation Commission (CA)

National industry associations played a key role in this project. Support for the project was provided through identification of printed resources, identification of Stakeholder Committee members, review of draft deliverables, among other tasks. The American Association of State Highway and Transportation Officials (AASHTO), Association of Metropolitan Planning Organizations (AMPO), National Association of Regional Councils (NARC), National Association of Development Organizations (NADO), American Public Transportation Association (APTA), American Planning Association (APA), and Community Transportation Association of America (CTAA) all offered support to this project from its conception through final adoption of the Guidebook. Specific individuals we would like to thank are:

Rich Denbow	AMPO
Matt Hardy	AASHTO
Jason Jordan	APA
Carrie Kissel	NADO
Rich Weaver	APTA
Erika Young	NARC
Chris Zeilinger	CTAA

Finally, Egan Smith and Harlan Miller have provided their ongoing support for this project with a clear guiding vision of performance-based planning and programming.

EXECUTIVE SUMMARY

Over the past two decades, transportation agencies have increasingly been applying “performance management” – a strategic approach that uses performance data to support decisions to help achieve desired performance outcomes. Performance management is credited with improving project and program delivery, informing investment decision-making, focusing staff on leadership priorities, and providing greater transparency and accountability to the public.

Performance-based planning and programming (PBPP) refers to the application of performance management within the planning and programming processes of transportation agencies to achieve desired performance outcomes for the multimodal transportation system. This includes a range of activities and products undertaken by a transportation agency together with other agencies, stakeholders, and the public as part of a 3C (cooperative, continuing, and comprehensive) process. It includes development of: long range transportation plans (LRTPs), other plans and processes (including those Federally-required, such as Strategic Highway Safety Plans, Asset Management Plans, the Congestion Management Process, Transit Agency Asset Management Plans, and Transit Agency Safety Plans, as well as others that are not required), and programming documents, including State and metropolitan Transportation Improvement Programs (STIPs and TIPs). PBPP attempts to ensure that transportation investment decisions are made – both in long-term planning and short-term programming of projects – based on their ability to meet established goals.

Moving Ahead for Progress in the 21st Century (MAP-21) placed increased emphasis on performance management within the Federal-aid highway program and transit programs, and requires use of performance-based approaches in statewide, metropolitan, and non-metropolitan transportation planning. This guidebook describes a PBPP process, as shown in Figure ES-1, along with examples of effective practices to help practitioners advance these approaches in their own planning and programming activities.

Figure ES-1. Framework for PBPP



This framework demonstrates how PBPP stages fit within a traditional planning and programming process. It includes the following elements:

Strategic Direction (*Where do we want to go?*) – In the transportation planning process, strategic direction is based upon a vision for the future, as articulated by the public and stakeholders. PBPP includes:

- **Goals and Objectives** – Stemming from a state or region’s vision, goals address key desired outcomes, and supporting objectives (specific, measurable statements that support achievement of goals) play a key role in shaping planning priorities.
- **Performance Measures** – Performance measures support objectives and serve as a basis for comparing alternative improvement strategies (investment and policy approaches) and for tracking results over time.

Planning Analysis (*How are we going to get there?*) – Driven by data on performance, along with public involvement and policy considerations, agencies conduct analysis in order to develop investment and policy priorities.

- **Identify Trends and Targets** – Preferred trends (direction of results) or targets (specific levels of performance desired to be achieved within a certain timeframe) are established for each measure to provide a basis for comparing alternative packages of strategies. This step relies upon baseline data on past trends, tools to forecast future performance, and information on possible strategies, available funding, and other constraints.
- **Identify Strategies and Analyze Alternatives** – Performance measures are used to assess strategies and to prioritize options. Scenario analysis may be used to compare alternative packages of strategies, to consider alternative funding levels, or to explore what level of funding would be required to achieve a certain level of performance.
- **Develop Investment Priorities** – Packages of strategies for the LRTP are selected that support attainment of targets, considering tradeoffs between different goal areas, as well as policy priorities.

Programming (*What will it take?*) Programming involves selecting specific investments to include in an agency capital plan and/or in a TIP or STIP. In a PBPP approach, programming decisions are made based on their ability to support attainment of performance targets or contribute to desired trends, and account for a range of factors.

- **Investment Plan** – In order to connect the LRTP, which has an outlook of at least 20 years, to selection of projects in a TIP/STIP, some areas develop a mid-range (e.g., 10 year) investment plan or investment program.
- **Resource Allocation / Program of Projects** – Project prioritization or selection criteria are used to identify specific investments or strategies for a capital plan or TIP/STIP. Projects included in the TIP/STIP are selected on the basis of performance, and show a clear link to meeting performance objectives.

Implementation and Evaluation (*How did we do?*) – These activities occur throughout implementation on an on-going basis, and include:

- **Monitoring** – Gathering information on actual conditions.
- **Evaluation** – Conducting analysis to understand to what extent implemented strategies have been effective.
- **Reporting** – Communicating information about system performance and the effectiveness of plans and programs to policymakers, stakeholders, and the public.

In a PBPP approach, each step in the process is clearly connected to the next in order to ensure that goals translate into specific measures, which then form the basis for selecting and analyzing strategies for the long range plan. Ultimately, project selection decisions are

influenced by expected performance returns. Keeping the next step in the process in mind is critical to each step along the way.

Public involvement and data are critical throughout the process. The public's vision for the transportation system and their community plays a key role in determining goals, performance measures, and investment priorities. Data on past, existing, and expected future performance, and information on the effectiveness of possible strategies, helps to inform selection of priorities. Like all planning, the process is cyclical. Over time, and as planning cycles advance, the goals and objectives may be adjusted, and performance measures and targets may be refined to ensure they focus on the most important priorities and are achievable.

Lessons for effective implementation of a PBPP approach include:

- *Use measures that matter.* Rather than identifying hundreds of measures, it is often preferable to identify a limited set of key measures to best support goals and objectives, guide investment decisions, and evaluate progress.
- *Engage the public and stakeholders.* Public engagement is critical to identify the issues that residents care about most. Some organizations have chosen to go beyond standard measures such as traffic delay and pavement condition, and to ask questions such as which types of congestion are most problematic and what types of risk factors are most important in managing assets, in order to identify goals and objectives. In addition, keep the public and stakeholders in mind when developing measures to ensure that they are easy to understand and resonate.
- *Build on required performance-based approaches,* such as State Asset Management Plans, State Strategic Highway Safety Plans (SHSPs), MPO Congestion Management Processes (CMPs), Transit Agency Asset Management Plans, and Transit Agency Safety Plans.
- *Communicate successes, constraints, and trade-offs.* It may not always be feasible to improve system performance, but information on expected performance outcomes of different options helps to inform decision-making. This information can inform not only where and how to prioritize funding, but can help make the case for the needs for additional funding. Scenario planning is an approach that greatly enhances agencies' ability to evaluate the anticipated impacts of various investment packages.
- *Coordinate and collaborate broadly.* Effective PBPP involves coordination within agencies and across agencies so the State DOTs, MPOs, nonmetropolitan planning organizations (also referred to as Rural Planning Organizations or Regional Transportation Planning Organizations (hereafter "RTPOs")), and transit agencies are coordinated in the development of goals, objectives, performance measures, and

targets. It also involves coordination with a wide range of partners, including local governments, the business community, freight communities, law enforcement, economic development, and others.

- Link planning to programming (the LRTP to the TIP/STIP in most cases). This linkage is key for all transportation agencies. Economic tools, project prioritization processes, and related approaches that build on performance information can inform project selection and show the link between programs of projects and intended performance outcomes.
- Provide context for performance results. A recent trend in performance management has been to develop dashboards and other data visualization techniques. These tools are helpful for communicating data; however, using a simplified approach to reporting data could create a risk for misinterpretation. It is important to tell a story and combine data with an explanation of performance results.

1. PURPOSE AND OVERVIEW

The motivation to implement performance-based approaches in transportation decision-making is substantial. Greater competition for limited funding, a need to strategically focus investments, and heightened demand for public sector accountability and transparency are prominent features of transportation planning and programming today. These trends underscore the need to achieve desired transportation system outcomes in the most cost effective way.

Performance-based planning and programming (PBPP) refers to the application of performance management principles within the planning and programming processes of transportation agencies to achieve desired performance outcomes for the multimodal transportation system. PBPP attempts to ensure that transportation investment decisions are made – both in long-term planning and short-term programming of projects – based on their ability to meet established goals for improving the overall transportation system. Furthermore, it involves measuring progress toward meeting goals, and using information on past and anticipated future performance trends to inform investment decisions.

PBPP is inherently data-driven, and widely considered to be a best practice in the transportation industry. Implementation of PBPP can vary based on a region’s size, geography, level and type of development, and the political context. State departments of transportation (State DOTs), Metropolitan Planning Organizations (MPOs), non-metropolitan planning organizations (known as Regional Transportation Planning Organizations/RTPOs, or Rural Planning Organizations/RPOs), transit agencies, local governments, and other partners that are involved in transportation decision-making can use a PBPP approach, which benefits from coordination among agencies. Though the scale of activities for these agencies and federal planning requirements differ, this Guidebook identifies PBPP elements that are common to all while highlighting examples of approaches that apply to different types of agencies involved in metropolitan and statewide and non-metropolitan transportation planning and programming.

The Guidebook has been designed to help State DOTs, MPOs, RTPOs, transit agencies, and other partner organizations understand:

- The key elements of a PBPP process,
- The relationship of these elements within existing planning and programming processes, and
- Examples of best practices to help support implementation.

The Guidebook builds on existing PBPP resources and tools, including a white paper and a series of workshop discussions that FHWA and FTA have sponsored to encourage dialogue among the transportation community (see <http://www.fhwa.dot.gov/planning/pbp/>).

Building on Existing Practices

PBPP builds on the concept of “performance management,” a strategic approach that uses data to support decisions that help to achieve performance goals. For the past several decades, transportation agencies have been transitioning toward performance-based approaches to support decision-making. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 emphasized multimodal solutions, public involvement, and flexibility in transportation funding; and required states to develop a series of management systems addressing asset conditions (pavement, bridges, public transportation and equipment) and efficient system performance (safety, congestion management, and intermodal connections). While most of these management system requirements were subsequently made voluntary, many states and regions continued using data to monitor transportation system conditions and performance, using this information to support investment decision-making.

Since that time, basic performance measures used by some State DOTs have evolved into sophisticated agency-wide strategic performance management initiatives that are credited with helping many DOTs meet challenges such as managing scarce financial resources more effectively, focusing staff on leadership priorities, and providing greater accountability to the public. Almost every state uses strategic planning in some form, and all State DOTs use performance measures at various programmatic levels.¹ Many, if not most, MPOs, transit agencies, and other transportation agencies also collect data that are used to support decision-making.

Moreover, many states are implementing transportation asset management (TAM) -- a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively through their life cycle. TAM supports a strategic resource allocation process that uses a performance-based approach, with the objective of better decisionmaking based upon quality information and well-defined objectives.² States are also required to use a performance-based process through their data-driven development of Strategic Highway Safety Plans (SHSPs), which involve tracking safety indicators, analyzing data, and identifying emphasis areas and strategies. Each state’s Highway Safety Improvement Program (HSIP) should be

¹ Washington State DOT, *Performance Measurement Library*, available at:

<http://www.wsdot.wa.gov/Accountability/Publications/Library.htm>.

² AASHTO, *Transportation Asset Management Guide: A Focus on Implementation*, available at:

<http://www.fhwa.dot.gov/asset/hif10023.pdf>.

consistent with the SHSP, and includes collecting and maintaining data, conducting studies, establishing priorities, and implementing and evaluating the effectiveness of safety improvements.³

Most MPOs conduct travel demand modeling and have used performance measures to evaluate plan alternatives through model forecasts. MPOs in areas with populations greater than 200,000, Transportation Management Areas (TMAs), are also required to have a performance-based Congestion Management Process (CMP), which requires identification of congestion objectives, selection of performance metrics, monitoring of system performance, analysis and selection of strategies, and evaluation of effectiveness.⁴ Meanwhile transit agencies receiving funds from the Federal Transit Administration (FTA) also track ridership, vehicle age, and other metrics as part of their reporting to the National Transit Database (NTD).⁵ Some transit agencies are using performance information, such as ridership and on-time performance, to support operational and capital programming decisions.

Moving Ahead for Progress in the 21st Century (MAP-21), signed into law in 2012, places increased emphasis on performance management within the Federal-aid highway program, including development of national performance measures to be used by State DOTs and MPOs in setting targets.⁶ It also emphasizes performance management within the Federal transit program, including development of national performance measures in relation to state of good repair and safety, which are to be used by transit agencies in setting targets.⁷

The law specifically calls for the use of *performance-based decision-making within metropolitan transportation planning and statewide and nonmetropolitan transportation planning* [see text box that follows]. It also includes additional requirements for performance-related processes. For instance, State DOTs are required to develop a risk-based asset management plan for the National Highway System to improve or preserve the condition of the assets and the

³ FHWA, *Highway Safety Improvement Program Manual*, January 2010, available at:

<http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/fhwasa09029.pdf>.

⁴ FHWA, *Congestion Management Process Guidebook*, April 2011, available at:

http://www.fhwa.dot.gov/planning/congestion_management_process/cmp_guidebook/.

⁵ Although transit agencies feed performance information into the National Transit Database, there is no requirement to use this data for performance-based decision-making. NTD data is used largely for apportionment of federal funds.

⁶ Federally required national performance measures address: pavement conditions and performance for the Interstate and NHS, bridge conditions, injuries and fatalities, traffic congestion, on-road mobile source emissions, and freight movement on the Interstate System [Section 1203, amending 23 USC Section 150(c)].

⁷ Section 20019, 49 USC Section 5326 Transit Asset Management; Section 20021, 49 USC Section 5329 Public Transportation Safety Program.

performance of the system; large MPOs are required to develop a performance plan in relation to the Congestion Mitigation and Air Quality Improvement (CMAQ) Program; and transit agencies are required to develop transit asset management plans and agency safety plans that include performance targets. State DOTs, MPOs, and transit agencies also must coordinate in the development of targets associated with national measures.⁸

Requirements for Performance-Based Planning and Programming

Metropolitan transportation planning: “[MPOs]..., in cooperation with the State and public transportation operators, shall develop long-range transportation plans and transportation improvement programs through a performance-driven, outcome-based approach to planning.” 23 USC Section 134(c)(1); 49 USC Section 5303(c)(1). “The metropolitan transportation planning process shall provide for the establishment and use of a performance-based approach to transportation decisionmaking to support the national goals...” 23 USC Section 134(h)(2); 49 USC Section 5303(h)(2).

Statewide and nonmetropolitan transportation planning: “The statewide transportation planning process shall provide for the establishment and use of a performance-based approach to transportation decisionmaking to support the national goals...and the general purposes [of the public transportation program]. The performance measures and targets established [in relation to national performance measures] shall be considered by a State when developing policies, programs, and investment priorities reflected in the statewide transportation plan and statewide transportation improvement program.” 23 USC Section 135(d)(2); 49 USC Section 5304(d)(2).

Within this evolving context, this Guidebook is designed to highlight effective practices to help transportation agencies in moving toward a performance-based approach to planning and programming. The Guidebook is not intended to establish requirements or standardize practices that must be used for all agencies; it is designed to provide useful concepts and key lessons for effective implementation.

While many agencies have taken steps toward a PBPP approach, implementing PBPP could involve adjustments over multiple planning cycles, as agencies collect and use data to inform decision-making and refine these approaches over time. Agencies using this Guidebook should expect that implementing PBPP does not involve a one-time set of activities but involves a

⁸ State target selection shall be coordinated with the relevant MPOs to ensure consistency, to the maximum extent practicable; in urbanized areas not represented by a MPO, selection of performance targets shall be coordinated, to the maximum extent practicable, with providers of public transportation [23 USC Section 135(d)(2)(B) and 49 USC Section 5304(d)(2)(B)]. MPO target selection shall be coordinated with the relevant State and providers of public transportation, to the maximum extent practicable [23 USC Section 134(h)(2)(B) and 49 USC Section 5303(h)(2)(B)]

continuous improvement approach incorporated into the on-going cycles of planning and programming.

Integrating Performance Management into Planning and Programming

Many transportation agencies currently have *performance management* programs. 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.⁹ Performance management can be applied to many aspects of an agency's activities, including planning, operations, and maintenance, and typically addresses both the management of the transportation system and management of organizations. Commonly, the concept is applied in relation to specific issues, such as safety, asset condition, and operational performance, in order to track year-to-year performance trends, and to align staffing and budgeting to achieve desired performance targets within specific program areas. For instance, a State DOT may set targets and track performance in project delivery timeframes in order to focus attention on business processes to reduce project delays. Similarly, a transit agency may set targets for bus on-time performance and track data by route to identify necessary schedule and operational adjustments. While most transportation agencies are using performance management approaches in some form, these efforts often have not been fully integrated into transportation planning and programming.

Performance-based planning and programming involves integrating performance management concepts into the existing federally-required transportation planning and programming processes. PBPP 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.

PBPP should involve a range of activities and products undertaken by a transportation agency, working together with other agencies, stakeholders, and the public, as part of a 3C (cooperative, continuing, and comprehensive) process. These activities include:

⁹ For more information see: FHWA, Transportation Performance Management, <http://www.fhwa.dot.gov/tpm/about/tpm.cfm>.

- **Long range transportation plans (LRTPs).** Required for both State DOTs and MPOs¹⁰ these documents vary significantly in terms of what is included and the depth of analysis used to create them, especially for DOTs. Some DOTs, MPOs, RTPOs, and local agencies also develop comprehensive visions or broader planning documents that account for transportation, land use, housing, the environment, and other issues that impact their communities, though these are not required by federal law.
- **Federally-required plans and processes.** Currently, transportation agencies are required to develop a number of documents that have performance-based elements that should be integrated into a PBPP process. Each State DOT is required to develop a Strategic Highway Safety Plan (SHSP), a major component of the Highway Safety Improvement Program (HSIP),¹¹ to address safety of the highway system; each State DOT also is required to develop a risk-based Transportation Asset Management Plan.¹² MPOs in regions with over 200,000 residents – called Transportation Management Areas (TMAs) – are required to develop a Congestion Management Process (CMP), which addresses congestion on the multimodal transportation system.¹³ Air quality conformity analysis is also required for areas in nonattainment or maintenance status with the National Ambient Air Quality Standards (NAAQS). Transit agencies are required to adopt Public Transportation Agency Safety Plans and Transit Asset Management Plans.¹⁴
- **Other (corridor, investment, and modal) plans.** In addition to federally required plans, many DOTs, MPOs, RTPOs, and transit agencies conduct a range of more detailed planning efforts to address transportation issues in a specific corridor, program area, mode, or other portion of the transportation system. For example, some transit agencies use transit development plans to help identify needed transit investments. Some DOTs, MPOs, and RTPOs develop operations, Intelligent Transportation Systems (ITS), or transportation demand management (TDM) plans that identify needs related to these aspects of transportation system implementation. Some agencies also develop more detailed investment plans that address specific areas of a state or specific types of investments. Many MPOs have also been involved in creating regional sustainability plans, which typically include a transportation plan and sustainable performance measures. In addition some metropolitan regions have developed a Regional Concepts for Transportation Operations, a management tool used by planners and operations practitioners to define a strategic direction for improving regional transportation

¹⁰ The LRTP at an MPO is sometimes called a Metropolitan Transportation Plan (MTP) or Regional Transportation Plan (RTP).

¹¹ 23 USC Section 148.

¹² 23 USC Section 119(e).

¹³ 23 USC Section 134(k)(3).

¹⁴ 49 USC Section 5329(d) and 49 USC Section 5337(a)(4).

management and operations in a collaborative manner.¹⁵ Each of these can utilize a performance-based approach and tie into a broader PBPP process that informs the LRTP.

- **Transportation Improvement Programs (TIPs).** TIPs are developed by MPOs to identify the transportation projects and strategies from the Metropolitan Transportation Plan (MTP) that it plans to undertake over the next four years. All projects receiving federal funding must be in the TIP. The TIP is the region's way of allocating its limited transportation resources among the various capital and operating needs of the area, based on a clear set of short-term transportation priorities.¹⁶ Historically, TIPs do not typically include analysis of transportation system performance. However, performance analysis from the TIP can be achieved by linking investments to goals/performance measures and assessing the impact of the selected investments.
- **Statewide Transportation Improvement Programs (STIPs).** STIPs are similar to TIPs in that they identify statewide priorities for transportation projects and must be fiscally constrained. Through an established process, the State DOT solicits or identifies projects from rural, small urban, and urbanized areas of the state. Projects are selected for inclusion in the STIP based on adopted procedures and criteria. TIPs that have been developed by MPOs must be incorporated directly, without change, into the STIP.¹⁷

Challenges Associated with PBPP

Although states, MPOs, RTPOs, transit agencies, and other transportation agencies are more commonly tracking performance measures, many challenges remain to the implementation of PBPP. For instance:

- Although State DOTs, transit agencies, MPOs, and RTPOs collect and analyze large amounts of data, turning data into information that can guide planning and programming decisions remains a complex issue.
- Many transportation agencies are concerned about risks involved with setting targets. Limited funding levels or external factors, such as faster than anticipated population growth, can result in situations where transportation performance can worsen despite valuable investments. At many states and MPOs, there is a large gap between projected needs and projected revenues for transportation projects and services. Agencies express anxiety regarding the undetermined consequences of failure to achieve targets, particularly given the influence of external factors beyond their control.

¹⁵ FHWA, The Regional Concept for Transportation Operations: A Practitioner's Guide, <http://www.ops.fhwa.dot.gov/publications/fhwahop11032/fhwahop11032.pdf>.

¹⁶ FHWA, The Transportation Planning Process: Key Issues, A Briefing Book for Transportation Decisionmakers, Officials, and Staff, <http://www.planning.dot.gov/documents/briefingbook/bbook.htm#1BB>.

¹⁷ FHWA The Transportation Planning Process: Key Issues, A Briefing Book for Transportation Decisionmakers, Officials, and Staff, <http://www.planning.dot.gov/documents/briefingbook/bbook.htm#1BB>.

- Collecting data, monitoring performance, conducting baseline assessments, and re-evaluating programs and policies – all fundamental components of PBPP – can be resource-intensive. Some agencies may not have staff or funding resources to implement a robust data collection system. While it is important that performance measures are not chosen solely on already-available data, the cost of obtaining new data and the effort required to analyze it must be taken into account. If there are questions about whether data will be available in the future for a chosen measure, an agency may want to consider the alternative measure it will use if data is not available.
- Tools to accurately predict future performance outcomes from investments and strategies are not well developed for many performance areas.
- The many different transportation agencies, levels of government, and stakeholders involved in transportation decision-making can create challenges in developing agreement on common goals, objectives, and targets. Moreover, restrictions on project funding using different funding sources can add further challenges in selecting investments to support goals and objectives.
- A desire to spread funding geographically and the variety of funding sources (both by jurisdiction and specific modal programs) can also be a barrier to linking performance measures to program area investments.
- A time lag exists between the implementation of many transportation improvements and the resulting changes to performance indicators, making the connection between decision making and results unclear. Moreover, system-wide measures used for monitoring performance may be different than measures or criteria that can be used for prioritizing strategies or projects.

There are no simple solutions to these challenges. Over the past several years, FHWA and FTA have been supporting dialogue about PBPP to help transportation agencies learn from each other and share information on best practices. Activities have included a series of national and regional (multi-state) workshops in coordination with industry stakeholders including the American Association of State Highway and Transportation Officials (AASHTO), Association of Metropolitan Planning Organization (AMPO), National Association of Regional Councils (NARC), American Public Transportation Association (APTA), and National Association of Development Organization (NADO), as well as development of resources focused on performance-based processes, such as TAM, SHSPs and CMPs. In addition, FHWA and FTA developed a White Paper, which laid out key concepts in PBPP.¹⁸ Under the National Cooperative Highway Research Program (NCHRP), several important guides and resources have been developed, including NCHRP Report 666: *Target-Setting Methods and Data Management to Support Performance-*

¹⁸ FHWA, Performance Based Planning, http://www.fhwa.dot.gov/planning/performance_based_planning/.

Based Resource Allocation by Transportation Agencies, NCHRP Project 8-36 Task 104 *Performance-Based Planning and Programming Pilots*, and a series of projects under NCHRP 20-24(37) *Measuring Performance among State DOTs: Sharing Good Practices*. NCHRP and AASHTO also have been working together to move the industry to a focus on Transportation Performance Management. The lessons and experiences from those activities form a basis for this Guidebook.

Organization and Use of this Guidebook

The Guidebook is organized around the basic elements of a PBPP process:

- Section 2- *Overview of PBPP: Key Concepts* introduces basic principles of performance-based planning and programming, including an overall framework and common themes that are features in successful performance-based approaches.
- Sections 3 to 9 step through a PBPP process, addressing the following components:
 - *Develop Goals and Objectives* (Section 3);
 - *Select Performance Measures* (Section 4)
 - *Identify Trends and Targets* (Section 5);
 - *Identify Strategies and Analyze Alternatives* (Section 6);
 - *Develop Investment Priorities in the LRTP* (Section 7);
 - *Programming: Develop Investment Priorities in the TIP/STIP* (Section 8); and
 - *On-going Monitoring, Evaluation, and Performance Reporting* (Section 9).
- Section 10 – *Keys to Success* highlights tips and success factors for an effective process.
- Section 11 – *Case Studies* provides four examples of agencies that have been using PBPP approaches:
 - Champaign Urbana Urbanized Area Transportation Study (Champaign-Urbana, Illinois MPO)
 - Minnesota Department of Transportation
 - Southeast Michigan Council of Governments (Detroit area MPO)
 - Washington Metropolitan Area Transit Authority.
- Section 12 - *Additional Resources* provides a glossary and links to relevant reference documents and relevant websites.

Throughout the document, examples from around the country of DOTs, MPOs, RTPOs, and transit agencies are provided to help the reader understand how PBPP approaches have been implemented.

In addition to this document, companion documents are being developed focused specifically on the LRTP (*Model Long Range Transportation Plans: A Guide to Performance Based Planning*) and STIP (*Electronic-STIPs: A Guide to Incorporating Performance Measures in Programming*). These forthcoming resources will provide more detail on the implementation of PBPP within federally-required planning and programming documents.

2. OVERVIEW OF PBPP: KEY CONCEPTS

While performance management has its roots in the private sector, where it is used to improve business outcomes, performance management has become increasingly common among public-sector agencies. Whether the process is public or private, the strategic objective of a performance based approach is to use performance information to make decisions that are more effective and efficient and lead to improved outcomes.

Within transportation planning and programming, this means selecting investments to most effectively and efficiently achieve desired outcomes, as determined through public input and agency strategic direction. A PBPP process becomes cyclical with information on the performance of the system and the expected benefits of system improvements strategically directing investments.

PBPP is an integrated way of doing business within statewide, metropolitan, and non-metropolitan transportation planning and programming. While some transportation agencies have dedicated staff for performance management, others do not. Regardless of the organizational structure for collecting, reporting, and using performance information, it is important that there is an understanding and buy-in among various departments within the agency and among stakeholders about a PBPP approach, given the cooperation associated with this approach. This section provides an overview of:

- The benefits of using a performance-based approach in planning and programming;
- Common elements of PBPP or basic steps as integrated into existing decision-making processes; and
- Important characteristics of PBPP.

Why Use a Performance-Based Approach to Planning and Programming?

There are many benefits to adopting a performance-based approach to planning and programming. PBPP focuses agencies on desired outcomes, outlines how to attain results, clarifies necessary resources and evaluates the results attained. Below are some of the advantages of adopting a performance-based approach to transportation planning and programming.

Improved Investment Decision Making

PBPP allows for clear and open discussions about desired outcomes of the public and the strategic direction that an agency should take. PBPP provides key information for the decision-making process by heightening the role of data and focusing attention on performance

outcomes. Furthermore, the focus on the multimodal transportation system helps officials move beyond “siloed” thinking and policymaking.

Improved Return on Investments and Resource Allocation

In a performance-based planning and programming cycle, information about past performance and expected future performance feeds into decisions about the best use of public funds, thus

increasing the return on investments made with increasingly scarce resources. Data on performance gaps and needs and the prioritization of projects using information on their contribution to meeting objectives also improves resource allocation. PBPP should be integrated into transportation asset management (TAM), transportation safety planning (TSP), congestion management and other performance-based processes, which supply data necessary for informed investment decision-making. By making decisions to improve how the transportation system functions, agencies engaged in PBPP can minimize life-cycle costs of keeping the transportation system in good condition.

Improved System Performance

By ensuring that resources are spent to achieve the goals set forth in a PBPP process, societal needs such as safety, mobility, asset preservation, and the environment can be addressed in accordance with the priority placed on each by the public. Rather than focusing on the stand-alone benefits of a specific project, PBPP encourages planners to evaluate and recommend strategies, projects, and programs to policy-makers based on anticipated system-wide impacts and support for goals.

Increased Accountability and Transparency

By providing clear documentation about why transportation dollars were spent in a certain manner and what were the performance results, gives the public a greater understanding and faith that transportation dollars are being spent wisely to solve the most pressing problems.

Demonstrates Link between Funding and Performance

Budgets across the country are tighter than ever, and policymakers’ funding decisions receive intense scrutiny by the public. Performance-based planning and programming—by offering

Demonstrating the Funding-Performance Link

In 2005, the Minnesota Department of transportation submitted a proposal to the state’s legislature that outlined a performance-based case for reallocating funding from highway construction to highway maintenance based on reports of poor pavement quality. By demonstrating that the adjustments would result in long-term savings, the DOT was able to get policymakers’ approval of the reallocation.

clear expectations about the level of performance that is likely to be achieved with a given level of funding—can help make the case for additional funding.

Terminology

Among transportation agencies, terminology related to performance management are often used in different ways – specifically, terms such as “goals,” “objectives,” “policies,” “principles,” “strategies,” and “recommendations” are sometimes used interchangeably or in ill-defined ways. What may be considered an objective in one area may be a goal in another, and sometimes the goals that are defined may be more like policies or strategies in another area. Moreover, terms like “performance measures,” “metrics,” “indicators,” and “measures of effectiveness” are often used in different places to represent essentially the same thing.

In order to have a common understanding of the process of PBPP, the following terms are defined in this document as follows (and an example for “safety” as a goal is provided):

- **A goal is a broad statement that describes a desired end state.**

For example: A safe transportation system.

- **An objective is a specific, measurable statement that supports achievement of a goal.** A good objective should include or lead to development of a performance measure that can be tracked over time and is used to assess different investment or policy alternatives.

For example: Reduce highway fatalities.

- **A performance measure is a metric used to assess progress toward meeting an objective.** Performance measures can be used in strategy analysis to compare different investment or policy alternatives and can be used to track actual performance over time.

Examples: Number of highway fatalities, fatality rate per vehicle mile traveled

- **A target is a specific level of performance that is desired to be achieved within a certain timeframe.** A target can be used as a basis for comparing progress over time to a desired outcome or for making decisions on investments.

Examples: Reduce fatalities by 5% by 2015, which will save more than 150 lives. Reduce serious (fatal/incapacitating injury) intersection crashes by 10% by 2015. This would represent an annual reduction of 516 serious intersection crashes compared to the

baseline year 2002. [From Ohio Department of Transportation 2008-2009 Business Plan and Strategic Highway Safety Plan¹⁹]

Common Elements of PBPP

While there are unique issues associated with transportation planning and programming at the statewide level, metropolitan level, non-metropolitan level, and within transit agencies – including different requirements in relation to long-range transportation plans (LRTPs), programming documents (TIP/STIP), and related processes and funding programs – there are common elements associated with PBPP.

Figure 1 provides a framework for PBPP, identifying primary process elements of an analytic approach to transportation planning and programming, drawing on discussions of PBPP among agencies across the country. This framework demonstrates how PBPP stages fit within a traditional planning and programming process.²⁰

¹⁹ Ohio Department of Transportation, *2008-2009 business Plan*, Goal 5. Available at:

<http://www.dot.state.oh.us/Divisions/Planning/SPPM/MajorPrograms/Safety/Pages/GoalsObjectives.aspx>

²⁰ See: FHWA and FTA, “The Transportation Planning Process: Key Issues – A Briefing Book for Transportation Decisionmakers, Officials, and Staff.” Updated September 2007. Available at:

<http://www.planning.dot.gov/documents/briefingbook/bbook.htm>.

Figure 1. Framework for PBPP



Strategic Direction (Where do we want to go?) - PBPP is based on a strategic direction, which is used to shape decisions about policies and investments. In the transportation planning process, strategic direction is based upon a vision for the future, as articulated by the public and stakeholders. This vision often encompasses broad community factors such as quality of life, economic vitality, and environmental quality. PBPP includes:

- **Goals and Objectives** – Stemming from a state or region’s vision, goals address key desired outcomes, and supporting objectives (specific, measurable statements that support achievement of goals) play a key role in shaping planning priorities.
- **Performance Measures.** Performance measures support objectives and serve as a basis for comparing alternative improvement strategies (investment and policy approaches) and for tracking performance over time.

Planning Analysis (*How are we going to get there?*) – Driven by data on performance, along with public involvement and policy considerations, agencies conduct analysis in order to develop investment and policy priorities:

- **Identify Trends and Targets** – Preferred trends (direction of results) or targets (specific levels of performance desired to be achieved within a certain timeframe) are established for each measure to provide a basis for comparing alternative packages of strategies and measuring actual progress. This step relies upon baseline data on past trends, tools to forecast future performance, and information on possible strategies, available funding, and other constraints.
- **Identify Strategies and Analyze Alternatives** - Performance measures are used to assess strategies and to prioritize options. Scenario analysis may be used to assess alternative packages of strategies, to consider alternative funding levels, or to explore what level of funding would be required to achieve a certain level of performance.
- **Develop Investment Priorities** - This step builds on strategy analyses, and involves prioritizing strategies and investments and making tradeoffs between different goal areas with a system-level understanding of the level and mix of investments in a given area, for inclusion in the LRTP and related supporting plans. This step requires prioritizing what performance outcomes are most important. This process of prioritization should account for performance outcomes using analytical methods, as well as policy priorities, and concerns such as equity, environmental justice, and other considerations.

Programming (*What will it take?*) – Programming involves selecting specific investments to include in an agency capital plan and/or in a STIP or TIP. In a PBPP approach, programming decisions are made based on their ability to support attainment of performance targets or contribute to desired trends, and account for a range of factors.

- **Investment Plan** – In order to connect the LRTP, which has an outlook of at least 20 years, to selection of projects in a TIP/STIP, some areas develop a mid-range (e.g., 10 year) investment plan or investment program. The investment plan may essentially be incorporated into the LRTP for an MPO, or may involve a set of investment plans for a State DOT or transit agency, addressing different modes, districts, or program areas.
- **Resource Allocation / Program of Projects** – Project prioritization or selection criteria are used to identify specific investments or strategies for a capital plan or TIP/STIP. Projects included in the TIP/STIP are selected on the basis of expected performance, and show a clear link to meeting performance objectives.

Implementation and Evaluation (*How did we do?*) – These activities occur throughout implementation on an on-going basis, and include:

- **Monitoring** – Gathering information on actual conditions.
- **Evaluation** – Conducting analysis to understand to what extent implemented strategies have been effective.
- **Reporting** – Communicating information about system performance and the effectiveness of plans and programs to policymakers, stakeholders, and the public.

The data generated through monitoring system conditions and evaluating the impacts of investments feeds into subsequent cycles of planning, and are critical for refining objectives, measures and targets, and for informing prioritization of future investments.

A significant aspect of PBPP is that each step in the process is clearly connected to the next. Goals tie directly into specific, measurable and actionable objectives, which are often developed in connection with the selection of performance measures. These objectives and performance measures, in turn, are used to develop targets or desired trends and are a basis for selecting and analyzing strategies for the LRTP. The LRTP priorities are tied into project selection decisions for the TIP/STIP. Public involvement and data from monitoring and evaluation efforts are used throughout the process.

Common Themes within a PBPP Process

Some common themes within a PBPP process include: coordination and cooperation among planning partners; integration among planning activities; public and stakeholder involvement; and use of data and tools.

Cooperation and Coordination

Given that the transportation planning process is commonly referred to as a 3C process – due to its cooperative, continuing, and coordinated nature – collaboration among planning partners is vital in a PBPP process.

Within Agencies

PBPP will require greater internal agency coordination across “silos” that can occur when focusing on specific functional areas, such as safety, congestion, asset condition, and environmental programs. This goes beyond traditional approaches and requires coordination in thinking about how targets relate to each other, as well as considering concepts such as risk management, lifecycle costs, and long-term sustainability. PBPP involves considering the potential trade-offs among goal areas, and considering how strategies support more than one goal.

Across State DOTs, MPOs, RTPOs, and Transit Agencies

Effective PBPP almost always involves collaborative thinking about performance across agencies, particularly given the relationships of different agencies in transportation planning, project development, and operations. Specifically, State DOTs, MPOs, RTPOs, and transit agencies need to align their goals, objectives, measures, and targets with one another. This does not mean that each agency must use the same goals, objectives, and measures. Unique local circumstances, agency-specific issues, and differences between urban and rural areas can all spur variations among agencies in the emphasis placed on different performance areas. However, it is important that goals and objectives of various transportation agencies working in the same areas are supportive of each other.

With Traditional and Non-Traditional Planning Partners

In relation to many goals (e.g., safety, economic vitality, asset preservation, health, and environment), non-transportation decisions and strategies (e.g., driver behavior, vehicle technologies, and land use patterns) play an important role in determining and achieving desired outcomes. Therefore, setting goals and objectives may highlight the important role of collaboration between transportation agencies and other partners, such as local governments, the business community, freight communities, law enforcement, housing agencies, economic development organizations, and others. This approach has been effectively applied in Strategic Highway Safety Plans, which bring together transportation engineers, law enforcement, public education, and policy makers to examine data on the sources of safety problems and consider a full range of strategies. Planning partners in PBPP should include tribal governments, the health community, education community, resource agencies, Federal Land Management agencies, and others. Stakeholders and partners should

Linkages between State, MPO, and Transit Agency Performance-Based Plans

An MPO shall integrate in the metropolitan transportation planning process, the following elements of state and providers of public transportation Performance-Based plans directly or by reference:

- Goals
- Objectives
- Performance measures
- Targets

23 USC Section 134 (h) (2) (D)
49 USC Section 5303 (h) (2) (D)

A State shall integrate into the statewide transportation planning process, the following elements of state and providers of public transportation (in urbanized areas not represented by an MPO) Performance-Based plans directly or by reference:

- Goals
- Objectives
- Performance measures
- Targets

23 USC Section 135 (d) (2) (C)
49 USC Section 5304 (d) (2) (C)

also be kept in mind when developing measures to ensure they resonate, are easy to understand, and relate to common goals.

Linkages across Performance-Based Planning Activities

PBPP is integrated throughout the decision-making process. Consequently, data driven and performance-based plans should be integrated into a PBPP process. A range of plans outlined below use performance-based approaches, including the following:

State [Highway] Asset Management Plan: “A State asset management plan shall include strategies leading to a program of projects that would make progress toward achievement of the State targets for asset condition and performance of the National Highway System.” 23 USC Section 119(e).

State Strategic Highway Safety Plan: “[A] State shall have in effect a State highway safety improvement program under which the state (A) develops, implements, and updates a State strategic highway safety plan that identifies and analyzes highway safety programs and opportunities..., (B) produces a program or projects or strategies to reduce identified safety problems; and (C) evaluates the strategic highway safety plan on a regularly recurring basis in accordance with subsection (d)(1) to ensure the accuracy of the data and priority of proposed strategies.” 23 USC Section 148(c).

MPO Congestion Management Process: “The transportation planning process in a TMA shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities... through the use of travel demand reduction and operational management strategies. The development of a congestion management process should result in multimodal system performance measures and strategies that can be reflected in the metropolitan transportation plan and TIP.” 23 CFR Section 450.320(a),(b).

Transit Asset Management Plan: “...each recipient of Federal financial assistance under this chapter shall establish performance targets in relation to the performance measures established by [USDOT]....Each designated recipient of Federal financial assistance under this chapter shall submit to the Secretary an annual report that describes— “(A) the progress of the recipient during the fiscal year to which the report relates toward meeting the performance targets...for that fiscal year; and (B) the performance targets established by the recipient for the subsequent fiscal year.” 49 USC Section 5326(c).

Transit Agency Safety Plan: “...each recipient or State... shall certify that the recipient or State has established a comprehensive agency safety plan that includes...methods for identifying and evaluating safety risks throughout all elements of the public transportation system of the recipient...strategies to minimize the exposure of the public, personnel, and property to hazards and unsafe conditions...performance targets

based on the safety performance criteria and state of good repair standards...” 49 USC Section 5329(d).

State Freight Plans: “The Secretary shall encourage each State to develop a freight plan that provides a comprehensive plan for the immediate and long-range planning activities and investments of the State with respect to freight.” MAP-21, Section 1118, amending 23 USC 167.

Each of these documents and their associated processes include objectives, performance measures, data collection and monitoring, selection of strategies, and evaluation. These performance-based planning efforts can provide inputs and insights to inform State and MPO LRTPs, and should be developed to support the broader vision, goals, and objectives of the LRTPs.

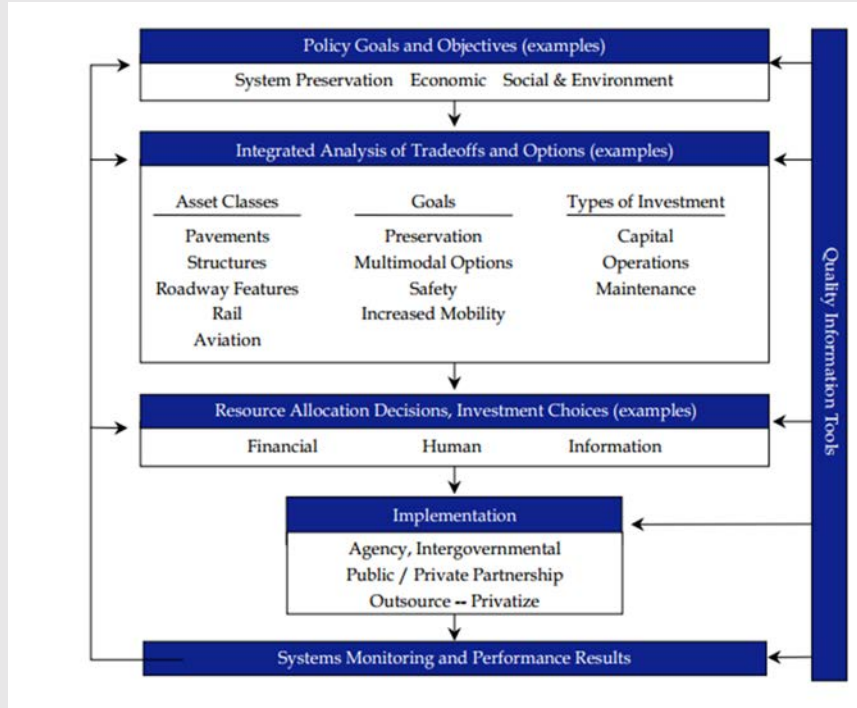
For instance, transportation asset management is a strategic and systematic process for managing physical assets effectively throughout their lifecycle in order to make better decisions based upon quality information and defined objectives, and is closely linked to PBPP. Consequently, a Transportation Asset Management Plan (TAMP) should connect with the LRTP and reflect common goals and priorities.²¹ The best way to define the relationship between asset management and performance based planning is to recognize that a transportation system’s performance depends on many factors influenced by the physical condition of facilities, including passenger and freight demand, safety characteristics, capacity, and user behavior. Agencies should try to ensure that the schedule for developing the TAMP aligns with planning and programming cycles so that the results can be incorporated into these processes. Planning staff should be involved in TAMP development so that there is heightened coordination between the TAMP and LRTP.

In addition to required plans, PBPP approaches can be applied to corridor planning efforts, transit agency capital program development, operations plans, and other efforts, so that these planning activities build upon the goals, objectives, and measures defined through the LRTP. It is important to recognize that since planning and programming is a continuing process, incremental changes can be made over time. Implementing a PBPP approach does not mean starting from scratch, but builds on existing plans, programs, and procedures.

²¹ See: FHWA, “Generic Work Plan for Developing a TAMP,” March 2013. In developing a TAMP, the agency will combine several related but often separate types of analyses: life cycle cost analysis, performance-based planning, risk assessment, financial planning, and programming.

VTrans – Performance-Based Asset Management Framework

VTrans, the Vermont Agency of Transportation has a sophisticated system of developing performance measures to guide its asset management, which shares many of the key PBPP process components. The agency’s Asset Management Framework, below, follows a clear performance-based approach to planning and programming that includes key steps such as goal-setting, analysis of strategies, resources allocation, and monitoring and reporting results. Like other PBPP processes, the agency’s process relies on quality information tools.



Source: VTrans Asset Management Vision and Work Plan,

<http://www.aot.state.vt.us/planning/Documents/Planning/VTrans%20Asset%20Mgmt%20VW.pdf>

Public and Stakeholder Involvement

Public involvement plays an important role in PBPP. While engaging the public is a required component of metropolitan and statewide and non-metropolitan transportation planning, and is a common practice among transportation agencies at all levels, the public should play a critical role at various stages of a PBPP process. These include: development of goals, development of objectives and performance measures, selection of targets, and assessment of strategies that feed into planning and programming decisions. Communicating to the public about performance also plays an important role so that the public and stakeholders understand the benefits of transportation investments and can play an informed role in selecting priorities.

Engaging elected officials is also important, so that they “buy in” to the benefits of a PBPP approach. This approach enhances decision making by building an awareness of the “big picture” providing the opportunity for decision-makers to focus on system performance as a basis for investment decisions as opposed to a focus on individual projects.

Communication with stakeholders is a critical element of PBPP. New technology has changed the way transportation agencies communicate with stakeholders and the public. Vast amounts of technical data can be communicated easily and quickly. Effective visualization significantly improves the ability to assess complex PBPP scenarios and proposed alternatives. Through the use of clear concise visuals—such as annotated maps, graphs, photos, illustrations, and videos— an audience can be made to quickly understand an important topic more effectively than through statistics and numerical tables.²² It can be used to identify, analyze and evaluate alternative scenarios for clear and effective public involvement and feedback.

Data and Tools

Data and analytical tools play a critical role throughout a PBPP approach. Conducting system or project analysis will require a suite of approaches, tools, and methodologies. Data are a foundation for:

- Selecting feasible performance measures,
- Understanding current system performance (developing a base line),
- Developing and tracking performance changes over time (monitoring conditions),
- Setting targets, and
- Evaluating the effectiveness of implemented strategies (for instance, through use of before-and-after data, surveys, or other means of collecting information).

Collecting, compiling, and analyzing data is often a challenge for agencies, including the costs of data collection and difficulty of using some types of data (such as the vast amount of real-time traffic information) for planning and programming decisions. However, there are a wide array of national, state, and local data sources and systems available. Some performance areas have significant on-going data collection efforts, such as the National Fatality Analysis Reporting System (FARS), the Highway Performance Monitoring System (HPMS), the National Bridge Inspection (NBI) Program, and the National Transit Database (NTD). Other areas, such as asset condition, have well established tools, such as pavement and bridge management systems.

Analysis tools also play an important role in forecasting future performance or in conducting analysis of alternative investments or scenarios. At the metropolitan level, regional travel

²² FHWA, Congestion Management Process, Showcasing Visualization Tools in Congestion Management, http://www.fhwa.dot.gov/planning/congestion_management_process/cmp_visualization_tools/.

demand forecasting models play a key role in analyzing issues such as vehicle travel, congestion, emissions, and access to jobs. Other types of analysis tools also may be used, such as economic analysis tools like the HERS-ST (Highway Economic Requirements System – State) tool, which can be used to assess benefit/cost ratios for different types of projects and to prioritize investment needs. TERM-Lite (Transit Economic Requirements Model – Lite) is a similar application that can be used to estimate an agency’s transit capital investment needs to maintain or improve the physical condition and performance of the agency’s transit infrastructure. The range of approaches used will vary by the level of maturity, size, and other differences among State DOTs, MPOs, and transit agencies.

Geographic Information Systems (GIS) also may support performance-based planning and sharing data among agencies, and provide a spatial component to data that can be helpful in identifying specific needs for targeted investments. Several GIS-based decision-support software tools are available that utilize visualization to display complex data analysis and scenarios to demonstrate potential implications of different plans and choices, support scenario planning, sketch planning, 3-D visualization, suitability analysis, impact assessment, growth modeling and other popular techniques.²³ These tools assist with understanding potential impacts of decisions on future outcomes and can help with decisions that address a wide range of strategies, including transportation investments and land use changes, and address a range of performance measures, including those related to mode shares, accessibility, and sustainability. Other tools, such as emissions models, can be combined with travel forecasting models, to estimate criteria pollutant and greenhouse gas emissions, for use in PBPP.

One challenge, however, is consistency in data elements, since common metrics and calculations over time are needed to track performance meaningfully, and this is not always easy as data formulations, models, and tools may change. In addition, many agencies do not have staff with the analytical skills necessary to handle the growing complexity and amount of performance data. FHWA’s Travel Model Improvement Program (TMIP) works to advance modeling capabilities and support transportation professionals in its mission of improving analysis practices to ensure that transportation professionals are well equipped to inform and support strategic transportation decisions.²⁴

²³ For more information, see <http://gis.fhwa.dot.gov/about.asp>

²⁴ FHWA, Travel Model Improvement Program, <http://www.fhwa.dot.gov/planning/tmip/>.

Feedback Mechanisms

The 3-C planning and programming process is by nature an on-going and cyclical process, and correspondingly, PBPP is by nature an iterative process that is refined over time. In a PBPP approach, as conditions are monitored and strategies are evaluated, this information may inform changes in later versions of plans and programs. For instance, strategies could be revisited or revised based on performance information, new performance measures may be selected to better reflect outcomes of most concern to the public and stakeholders, or targets may be adjusted to reflect new financial realities or external factors that affect the ability to attain targets. In programming, project selection criteria may be assigned different weights, or reconsidered, based on public input on the most important goals and priorities. Data collected through performance monitoring and evaluation, together with public input, provide important information to inform updated cycles of long range planning and programming.

3. DEVELOP GOALS AND OBJECTIVES

Setting clear goals and objectives is a critical foundation for any successful planning effort. Transportation planning recognizes the critical links between transportation and other societal goals. The planning process is more than merely listing highway and transit capital projects. It requires developing strategies for managing, operating, maintaining, and financing the area's transportation system, and selecting investments in such a way as to advance the area's long-term goals. Consequently, the transportation planning process generally begins with the development of a vision and broad goals that provide a strategic direction for investment and policy decisions.

While a performance-based planning and programming process does not change this key step or element in any substantial way, a fundamental principle of PBPP is that actions taken by a transportation agency should be based on strategic direction, and performance should be measured toward the attainment of desired outcomes. As a result, it is important to establish goals and objectives with careful thinking about how they will be used as a foundation for developing performance measures and targets for investment decision-making and for measuring performance. Goals and objectives should be developed in conjunction with both internal agency and external stakeholders. This section highlights principles, and examples of setting goals and objectives as a foundation within a PBPP approach.

Developing Goals: Focus on Outcomes

In a PBPP process, goals should ideally be developed with a focus on outcomes, rather than on activities or policies. A useful definition is:

A goal is a broad statement that describes a desired end state.

In the transportation planning process, goals stem from the values inherent in the community's vision for the future. These outcome-oriented goals set the strategic direction for a PBPP process, answering the questions:

- "What do we want our area to look like?"
- "What do we want to achieve?"

Goals should reflect agreed-upon system-wide priorities and should relate to outcomes that matter to the public, not just to the agency internally.

A key principle of PBPP is that each step in the planning process needs to be clearly connected to the next. This occurs from the initial goal setting phase. Often in planning, goal setting is

thought of as a “feel good” activity where everyone gets to have their key issue represented in some goal statement. Under PBPP, when developing goals, it is important to think about:

- What outcome are we trying to achieve?
- What role does the agency have in creating or supporting the outcome (do they control it, influence it, or simply philosophically agree with it)?
- What kind of data and analysis would be needed to develop measurable objectives to evaluate progress toward meeting the goal as part of investment decision-making (at the plan level) and at the project selection and outcome tracking level?
- Can we identify how this goal would “look” at the project level – for instance, could project selection criteria be used to support the goal?

The idea is to develop goals that will then form the basis for selecting investments, policies, or activities to help support the attainment of those outcomes, and that performance measures established in relation to these goals will carry through planning and programming decisions.

It is important to recognize that many factors influence transportation system performance, and transportation is only one component of a community: land use, housing, the economy, and natural resources also can play a role. As a result, outcomes may relate to aspects of the transportation system that are only partially under the control or influence of transportation agencies. Goals do not have to fall solely under the control the transportation agency, but the agency should consider its role in affecting outcomes, as well as the influence of factors such as land use decisions, the economy, vehicle technologies, and other issues.

As defined in this document, a goal itself does not have to include a measure or target but provides a focus on an issue that is important to a community. By elevating this issue as a goal, it takes on a critical role in the foundation in a PBPP process.

In addition to outcome-focused goals, an agency may have “guiding principles,” “policies,” or other statements that reflect values or priorities. These statements often are very important in setting priorities for investments and are used in the planning process to help guide decisions, but do not directly address an outcome for the transportation system that can be measured. These policy or action statements may reflect priorities of the public or be derived from analysis that reflects the role of certain strategies for meeting desired outcomes. Figure 2 shows examples of outcome-oriented goals in comparison to policy statements or principles.

Figure 2. Comparison between Policy/Action Statements/Principles and Outcome-Oriented Transportation Goals

Statements – <i>These may be policies, actions, or principles, but do not focus on a transportation system or community outcome</i>	Outcome-Oriented Goal
Prioritize safety first.	A safe transportation system.
Institute travel demand management strategies and provide alternatives to single-occupant vehicles.	Residents have multimodal choices.
Cost-effective operations strategies are preferable to highway capacity expansion.	Multi-modal transportation infrastructure and services are well-managed and optimized.
Transportation and land use decision-making should be linked.	Livable communities that provide a range of travel choices.

Goals may be developed that relate to the eight planning factors that are required to be considered in metropolitan and statewide and nonmetropolitan transportation planning under federal law.

Planning Factors to Be Addressed in Metropolitan and Statewide and Nonmetropolitan Transportation Planning

1. Support the economic vitality of the United States, the States, nonmetropolitan areas, and metropolitan areas, especially by enabling global competitiveness, productivity, and efficiency.*
2. Increase the safety of the transportation system for motorized and nonmotorized users.
3. Increase the security of the transportation system for motorized and nonmotorized users.
4. Increase accessibility and mobility of people and freight.
5. Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.
6. Enhance the integration and connectivity of the transportation system across and between modes, people and freight.
7. Promote efficient system management and operation.
8. Emphasize the preservation of the existing transportation system.

23 USC Section 135(d)(1) and 23 USC Section 134(h)(1) - *refers to “the metropolitan area”

In addition, the law requires use of a performance-based approach to support seven national goals for the transportation system. These goals should serve as an important basis for developing goals that are integrated into the planning of States, MPOs, RTPOs, transit agencies, and other planning partners.

National Goals for the Federal-aid Highway Program (23 USC Section 150(b))

1. **Safety** - To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
2. **Infrastructure Condition** - To maintain the highway infrastructure asset system in a state of good repair
3. **Congestion Reduction** - To achieve a significant reduction in congestion on the National Highway System
4. **System Reliability** - To improve the efficiency of the surface transportation system
5. **Freight Movement and Economic Vitality** - To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
6. **Environmental Sustainability** - To enhance the performance of the transportation system while protecting and enhancing the natural environment.
7. **Reduced Project Delivery Delays** - To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

While sometimes goal statements are thought of as too vague to be meaningful, the point in developing a goal is not that it should be precise. Goals set strategic priorities about what is important for a community, and serve as a basis for developing more detailed objectives, and corresponding performance measures and targets.

Examples of goals from various transportation planning documents are noted below.

- "Efficient Freight Travel" – *Transportation 2035: Change in Motion*, Metropolitan Transportation Commission (San Francisco Bay Area).
- "Provide options for safe access and expanded mobility choices in a cost-effective manner in the region." – *Communities in Motion 2030 Plan*, Community Planning Association of Southwest Idaho (COMPASS).
- "Improve the reliability and safety of the transportation system." – *2030 San Diego Regional Transportation Plan: Pathways for the Future*, San Diego Association of Governments.

- “Multi-modal transportation infrastructure and services are well-managed and optimized to improve travel conditions and operations.” – Final Draft, *2035 Regional Transportation Plan*, Metro (Portland, Oregon).

Mississippi DOT: Focusing on Core Goals

In 2011, Mississippi DOT developed its MULTIPLAN 2035. The Plan identifies a series of outcome-driven goals as well as strategies to accomplish the goals. The goals are depicted in the table below.

Goal	Description
Accessibility and Mobility	Improve Accessibility and Mobility for Mississippi’s People, Commerce and Industry
Safety	Ensure High standards of Safety in the Transportation System
Maintenance and Preservation	Maintain and Preserve Mississippi’s Transportation System
Environmental Stewardship	Ensure that Transportation System Development is sensitive to Human and Natural Environmental Concerns
Economic Development	Provide a Transportation System that Encourages and Supports Mississippi’s Economic Development
Awareness, Education and Cooperative Processes	Create Effective Transportation Partnerships and Cooperative Processes that Enhance Awareness of the Needs and Benefits of an Intermodal System
Finance	Provide a Sound Financial Basis for the Transportation System

These goals are then used as the basis for selecting performance measures for each goal area. For instance, under “Maintenance and Preservation” recommended measures include: percent of lane miles in “fair” condition or better; level of unmet bridge improvement needs; and percent of system airports with “good” pavement condition on their primary runways.

Source: Mississippi DOT, MULTIPLAN,

<http://sp.mdot.ms.gov/Office%20of%20Highways/Planning/Pages/Home.aspx>

Consider Goals Broadly

When starting a planning process by looking at goals, it is useful to consider a wide range of possible goals and then narrow down to no more than a dozen.

Traditionally, MPOs and RTPOs, have focused on broad societal goals (e.g., economic vitality, mobility, environment) but have placed less emphasis on infrastructure preservation and operations, while some State DOTs and transit agencies have placed more emphasis on goals related to infrastructure, maintenance, and operations issues, reflecting their roles as owners of facilities and operators of services. Within metropolitan and statewide and nonmetropolitan

planning, it is useful to consider the full array of goals that the public and stakeholders may have for the transportation system, including societal outcomes, such as economic development, livability, and sustainability. Complex situations often require input from many perspectives, including transportation planners, community leaders, citizens, environmental specialists, landscape architects, resource agencies, public works officials, design engineers, and elected officials. While a broad array of issues may be challenging to address in terms of collecting data or conducting analysis, identifying these issues in the goal setting stage is important to ensure that they receive attention within decision-making.

As an example, the Mid-America Regional Council, the MPO for the Kansas City metropolitan area, adopted its LRTP, called “Transportation Outlook 2040”, in June 2010. An extensive public outreach process that spanned two years and involved thousands of elected officials, planners, businesses, community organizations and citizens across the region was utilized in the development of a regional vision statement and nine goals to serve as a foundation for the plan’s content, identification of performance measures, and project evaluation and prioritization. The selected goals include several that have been used in the past – system performance, system condition, safety and security, accessibility, and economic vitality – as well as new goal areas – place making, public health, climate change/energy use, and the environment.²⁵

²⁵ Mid-America Regional Council, *Transportation Outlook 2040*, available at: <http://www.marc.org/transportation/lrtp.htm>.

Plan Bay Area Goals Tied to Sustainability Principles

The Metropolitan Transportation Commission (MTC), the MPO for the San Francisco Bay Area, and its sister agency, the Association of Bay Area Governments, released its performance targets for Plan Bay Area in January 2011. Adopted in July 2013, Plan Bay Area is the next step in a progression of decades of regional planning. New requirements from a 2008 California Senate Bill called for a reduction of GHG emissions caused by cars and light trucks. Achieving these reductions will be led by a Sustainable Communities Strategy that if successful will result in more transportation choices, create more livable communities, and help to reduce the pollution responsible for climate change. Plan Bay Area is based on the “three E’s” principles that underlie sustainability: economy, environment, and equity. But the plan acknowledges that these are not mutually exclusive and the plan identifies goals that relate to each. Performance targets below help to measure and evaluate the successfulness of the various land use scenarios, transportation investments, and policies being implemented in Plan Bay Area, and many are adapted from other plans such as California’s SHSP.

Plan Bay Area Goals and Targets

Goals	Targets
Climate protection	Reduce per-capita CO ₂ emissions from cars and light-duty trucks by 15%*
Adequate housing	House 100% of the region’s projected growth by income level (very-low, low, moderate, above-moderate) without displacing current low-income residents*
Healthy and Safe Communities	Reduce premature deaths from exposure to particulate emissions: <ul style="list-style-type: none"> • Reduce premature deaths from exposure to fine particulates (PM2.5) by 10% • Reduce coarse particulate emissions (PM10) by 30% • Achieve greater reductions in highly impacted areas Reduce by 50% the number of injuries and fatalities from all collisions (including bike and pedestrian) Increase the average daily time walking or biking per person for transportation by 70% (for an average of 15 minutes per person per day)
Open Space and Agricultural Preservation	Direct all non-agricultural development within the urban footprint (existing urban development and urban growth boundaries)*
Equitable Access	Decrease by 10% the share of low-income and lower-middle income residents’ household income consumed by transportation and housing
Economic Vitality	Increase gross regional product (GRP) by an average annual growth rate of approximately 2%
Transportation System Effectiveness	Increase non-auto mode share by 10% and decrease automobile vehicle miles traveled per capita by 10% Maintain the transportation system in a state of good repair: <ul style="list-style-type: none"> • Increase local road pavement condition index (PCI) to 75 or better • Decrease distressed lane-miles of state highways to less than 10% of total lane-miles • Reduce share of transit assets past their useful life to 0%

*Indicates targets derived or adapted from SB 375.

Source: http://onebayarea.org/pdf/Draft_Plan_Bay_Area/Performance_Report.pdf.

Developing Objectives

Once goals have been identified, the next component of a PBPP process is developing objectives. Although in transportation planning, developing objectives has often been discussed together with goals (i.e., “developing goals and objectives”), it is important to make a critical distinction between goals and objectives within a PBPP approach.

Whereas goals relate to the “big picture” or desired end-result, objectives should be specific and measurable. An objective is not just a sub-goal, but provides a level of specificity necessary to fully implement broader based goals.

An objective is a specific, measurable statement that supports achievement of a goal. A good objective should include or lead to development of a performance measure in order to support decisions necessary to help achieve each goal. Objectives that include specific targets and delivery dates (e.g., reduce pedestrian fatalities by 15 percent from 2010 levels by 2018) are commonly called “SMART” (specific, measurable, agreed-upon, realistic, time-bound).

Initially, a State, region, or agency may start out by developing a general objective, which identifies an issue of concern or focus area under a goal area through public and stakeholder outreach. Data and analysis tools used as part of CMP, Transportation Asset Management Plan (TAMP), SHSP or other processes are helpful in first identifying focus areas (understanding what factors are most important in attaining goals).

Identify Focus Areas

A first step in developing a set of objectives is to identify key issues or concerns that are related to the attainment of a goal. For instance, under a goal related to asset condition, focus areas may include bridges, tunnels, highway pavements, transit facilities (i.e., rail stations), and highway facilities (i.e., highway rest stops). Under a goal related to the environment, focus areas may include air quality, greenhouse gas emissions, water quality, and noise, among others. Each of these focus areas may become the basis for its own objective, or some topics may be combined or dropped.

Public and stakeholder involvement are key inputs for identifying and defining objectives that help to support goals. A key question to ask stakeholders is “what does X goal mean to you?” In addition, baseline data and an understanding of past conditions and future needs are typically very important in order to help define objectives. Baseline information helps to provide context about key issues, problems, or positive trends, as well as the sources of problems or explanation of trends. Objectives may also address ways in which transportation supports broader societal goals, such as enhance economic vitality by improving freight connectivity.

A Hierarchy of Objectives: Outcomes, Outputs, Activities

In developing objectives, it is helpful to consider a hierarchy of different types of objectives as shown below:

Table 1. Outcome, Output, and Activity-based Objectives

Type of Objective	Description	Example
Outcome	Reflect concerns of the public, customers, or stakeholders; these objectives are often the most meaningful to the public and relate most directly to system goals; however, they may be influenced by a range of factors beyond the control of transportation agencies.	<i>Reduce hours of incident-based delay experienced by travelers</i>
Output	Reflect quantity of activities that affect outcomes, and may be more directly influenced by a transportation agency (although they also may not be entirely in the control of the agency)	<i>Reduce the clearance time for traffic incidents</i> <i>(For incident clearance the transportation agency would need to work with law enforcement, etc.)</i>
Activity	Reflect actions that are taken by transportation agencies. These are less directly tied to the outcome, and often directly relate to a strategy being implemented.	<i>Increase the number of cameras tracking system conditions</i>

Source: Derived from FHWA and FTA, “Advancing Metropolitan Planning for Operations: The Building Blocks of a Model Transportation Plan Incorporating Operations - A Desk Reference,” April 2010.

Multiple types of objectives may be useful. Objectives that guide decisions in a LRTP should preferably be described in terms of system performance outcomes experienced by users (e.g., travel times, reliability, access to traveler information, fatalities, serious injuries, bridge conditions, etc.). These outcome objectives are more relatable to the public. However, it is also appropriate to select output or activity-based objectives. These activity-based objectives are appropriate for specific sections of the LRTP (such as a discussion of planned strategies), and to align with supporting documents that go into greater detail (such as an investment plan, SHSP, TAMP and CMP). All activity-oriented objectives should support outcome-oriented objectives, providing a simple check to make sure that they support a system performance outcome.

Other dimensions that may be considered in developing objectives include:

- **Type of Travel Affected:** Passenger or freight - For instance, under California's Sustainable Communities and Climate Protection Act of 2008 (SB 375), MPOs in the state are required to assess the performance of their LRTPs in regard to greenhouse gas emissions targets for passenger vehicles and develop sustainable communities strategies. Recognizing the importance of freight to the economy, some State DOTs and MPOs also have developed objectives focused on goods movement or freight corridors.
- **Mode:** Highway, transit, bicycle, walk, intermodal – For instance, a plan may contain specific objectives about accessibility to transit, level of availability of sidewalks, or level of roadway congestion; it might contain separate objectives related to reliability for freeways and for transit services, reflecting different types of metrics associated with these modes or to ensure consideration of each mode.
- **Geographic:** metropolitan area, state, rural area – An objective should consider geographic scale, recognizing that the level of importance of an issue may depend on location-specific factors.

Using an Objectives Decision Tree

One approach that can be used in strategic planning is to use a decision tree to define key issues of concern. An example is illustrated in Figure 3. An “objectives tree” illustrates the logical hierarchy that exists between outcome-based objectives and activity-based objectives. It can be used to connect regional goals to objectives and ultimately objectives to strategies in the transportation decision-making process.

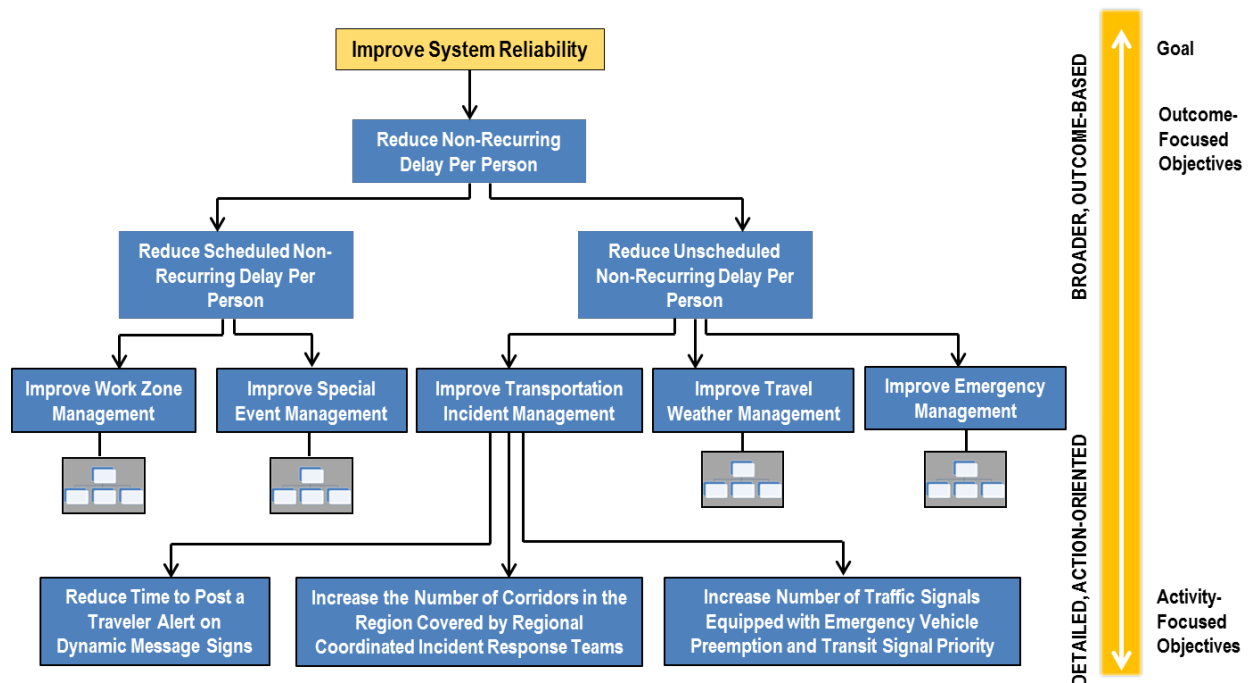
An objectives tree begins with a broad goal or high-order outcome-based objective relating to the performance of the transportation system. This objective answers the question, "What do we ultimately want to achieve?" In the example shown in Figure 3, the tree begins with the broad goal, "Improve system reliability." Based on that goal, the higher-order, outcome-based objective, "Reduce nonrecurring delay" is formed. This is how the region aims to achieve its goal of improving system reliability, and this objective may serve as a focus for the performance measures that are used for planning. To achieve this objective, two issues are identified: scheduled nonrecurring delay (associated with work zones and special events) and unscheduled nonrecurring delay (associated with incidents, weather conditions, and other emergency events). These two objectives are further refined to address the identified sources of delay. As the tree is developed, the objectives move from being outcome-based (focused on traveler experience) to a focus on outputs and activities (e.g., effective work zone management, incident management).

It may be challenging to collect data for an outcome objective, or there may be a need to develop more specific and detailed areas of focus, particularly for detailed planning processes. These detailed or lower order objectives as illustrated in the objectives tree were developed building on the higher order objectives. This process can be repeated for each goal or high-

order objective until the developers reach the point where the objective is measurable and is viewed as a worthwhile point for use in guiding planning decisions. These may include activity-oriented objectives in some cases.

A transportation agency can select which objectives in the objectives tree are most important to be included in the LRTP or other planning documents based on the anticipated outcomes. Outcome-oriented objectives such as those that may be near the top of an objectives tree can be used to guide investment planning, and are often used for long range planning. Activity-based objectives are often used at a more detailed level in analyzing strategies and could form the basis for more detailed discussion in other performance-based plans, such as an SHSP, CMP, TAMP, or modal plan.

Figure 3. Example of an Objectives Tree



Source: Derived from: FHWA and FTA, *Advancing Metropolitan Planning for Operations: The Building Blocks of a Model Transportation Plan Incorporating Operations - A Desk Reference*. Prepared by SAIC, Kittelson Associates, and ICF International, April 2010.

Evolution of Objectives

In practice, objectives may start out somewhat general (e.g., improve system reliability), but over time the objectives may be revisited and defined to be more specific, measurable, and time-bound (e.g., reduce the person hours of total delay on highways and major arterials associated with traffic incidents by X percent over Y years.). As shown in the objectives tree

above, by analyzing the sources of problems, one can define more specific objectives; moreover, as data are collected and analyzed, one can come up with specific targets in relation to these objectives.

Numerical targets can be incorporated into an objective statement to create what is often referred to as a “SMART” objective, which has the following characteristics:

- **S: Specific** – The objective provides sufficient specificity to guide formulation of viable approaches to achieving the objective without dictating the approach.
- **M: Measurable** – The objective facilitates quantitative evaluation, saying how many or how much should be accomplished.
- **A: Agreed** – Planners, operators, and relevant planning participants come to a consensus on a common objective. This is most effective when the planning process involves a wide range of stakeholders to facilitate regional collaboration and coordination.
- **R: Realistic** – The objective can reasonably be accomplished within the limitations of resources and other demands. The objective may require substantial coordination, collaboration, and investment to achieve. Factors such as land use may also have an impact on the feasibility of the objective and should be taken into account. Because how realistic the objective is cannot be fully evaluated until after strategies and approaches are defined, the objective may need to be adjusted to be achievable.
- **T: Time-Bound** – The objective identifies a timeframe within which it will be achieved (e.g., “by 2020”).

Developing “SMART” objectives is more commonly becoming recognized as a best practice as part of an objectives-driven, performance-based approach to planning, and can be applied with the LRTP and other related planning efforts. As an example, within a Congestion Management Process, a typical progression for developing SMART objectives may be as follows:²⁶

- Identify the important congestion concerns in the region.
- Select the area and time of focus, such as major arterials during peak hours.
- Identify what data are being collected or may be available. Based on this information, make the objectives more specific and define specific performance measures.

²⁶ FHWA and FTA, “Congestion Management Process: A Guidebook,” http://www.fhwa.dot.gov/planning/congestion_management_process/cmp_guidebook/.

- Consider growth trends, fiscal constraints, and other factors to develop realistic targets.

**Examples of a Progression in the Development of SMART Objectives:
Moving from Desired Trends to Targets**

By selecting appropriate measures of performance and analyzing available baseline data, trends, and expected performance, a basic objective can become more “SMART.”

Goal	Initial objectives (identifying desired trend)	SMART objectives (identifying specific numerical targets)
Safety	Reduce pedestrian fatalities	Reduce pedestrian fatalities by 15 percent from 2010 levels by 2018.
	Reduce intersection crashes	Reduce serious (fatal/incapacitating injury) intersection crashes 10% by 2015.
Mobility	Reduce traffic delays	Reduce hours of delay per capita by 15 percent by 2030.

CUUATS: Developing SMART Objectives

The Champaign-Urbana Urbanized Area Transportation Study (CUUATS), the transportation planning division of the MPO for the Champaign-Urbana region in central eastern Illinois, developed its LRTP, titled *Choices 2035*, which includes a set of goals tied to each of the Planning Factors. For each goal, the plan identifies objectives and performance measures. Many of these objectives include specific targets. The plan directly ties these objectives to priorities in the plan, identifying strategies to be implemented and responsible parties, which may include the Illinois DOT, CUUATS, cities and villages, or other entities. The table below shows an example of one goal, along with the supporting objectives, and measures of effectiveness (corresponding to performance measures). CUUATS also has developed annual LRTP report cards that provide an assessment of progress toward meeting each of the objectives.

Planning Process Level	Description		
Goal	1. Non-single occupancy vehicle travel will be a principal consideration of the transportation planning process to make the urbanized area more sustainable, efficient, and provide a higher quality of life for residents		
Objectives	Increase the miles of dedicated bicycle facilities and signed bike routes in the metropolitan planning area by 15% by 2014	Provide transit service within a 1/4 mile for 90% of residential development (new or existing) within the CU- MTD transit service area by 2014	By 2014, ensure that 100% of new development within the municipal boundaries or land annexed into a municipality provides sidewalks along roadway frontages through construction or a reservation of land and funds for construction, unless an acceptable alternative pathway is provided. Sidewalk connectivity must be analyzed with each new development proposal.
Measures of Effectiveness	Miles of Dedicated Bike Facilities	1 /4 Mile Coverage Analysis	Miles of New Sidewalk Constructed
	Miles of Signed Bike Routes	Number of Transit Routes	

Source: CUUATS, "Choices 2035," <http://www.ccrpc.org/transportation/lrtp2/documents.html>.

Involve the Public in Developing Goals and Objectives

Public engagement and processes to collect input from a variety of stakeholders, community leaders, and the public are important in defining goals and objectives. In a PBPP process, goals should be developed cooperatively with the community by identifying shared values and understanding of existing challenges. Utilizing visualization techniques for incorporating data on existing conditions (from on-going monitoring of system performance), into public and stakeholder engagement activities working collaboratively with policy-makers can provide for an open process for setting strategic directions. Public input should then be carried through the process to help inform development of objectives and performance measures.

One example of using public involvement to shape the direction of investment priorities and goal setting is Kansas DOT (KDOT), which embarked on a multi-year effort to reinvent its transportation planning and project selection processes to achieve greater public support, from 2003 to 2011. This effort involved a broad range of stakeholders, starting with administering more than 900 stakeholder satisfaction surveys across the state. Based on these results, KDOT recognized that the public wanted the agency to broaden its goals. The survey results indicated that KDOT's customers perceived the department as too focused on engineering considerations (e.g., percent pavement in good condition). As a result, KDOT developed a new Highway Selection Program methodology that incorporates economic benefit, along with engineering factors, and regional priorities. Economic benefits are calculated using empirical data and account for 25 percent of a project's overall score. KDOT is also adopting performance measures in each of six strategic areas including: pavement preservation and maintenance; safety; program and project delivery; economic impact; system modernization; and workforce priorities.²⁷

Similarly, the Chicago Metropolitan Agency for Planning (CMAP) undertook a unique effort in 2010 to solicit community input in determining its goals and the indicators to use in evaluating system performance. The agency worked with local organizations to facilitate public workshops in the seven counties that make up the Greater Chicago region. In total nearly 20,000 participants were engaged through public workshops, online tools, free-standing kiosks, and at fairs and festivals across the region. This input, combined with the agency's research has shaped the draft "preferred regional scenario."²⁸ In the resulting Go To 2040 Plan, each

²⁷ Eno Center for Transportation, "Better Use of Public Dollars: Economic Analysis in Transportation Decision Making," June 2012. <https://www.enotrans.org/wp-content/uploads/wpsc/downloadables/Public-Dollars3.pdf>; TRB Circular E-C115: Challenges of Data for Performance Measures: A Workshop, July 8, 2006, San Diego, CA. <http://onlinepubs.trb.org/onlinepubs/circulars/ec115.pdf>.

²⁸ Chicago Metropolitan Agency for Planning, <http://www.cmap.illinois.gov/public-engagement>.

chapter on a specific performance area (livable communities, human capital, efficient governance, and regional mobility) contains a list of key priorities that were identified through this thorough public engagement process.

We Move Massachusetts: Public Engagement

Massachusetts DOT (MassDOT) is currently in the process of completing “We Move Massachusetts” (WMM), the state’s multimodal strategic planning process. WMM is the state’s first comprehensive, data-based effort to prioritize transportation investments and in order to develop it, MassDOT undertook an extensive public outreach process aimed at identifying the priorities of Massachusetts residents in order to ensure that project selection occurs to address them. To conduct outreach, the DOT undertook “youMove Massachusetts,” a public outreach effort involving emails, targeted outreach to Environmental Justice and Title VI communities, media releases, social media and a blog, postings on community organization websites (in various languages), discussions with health and legislative stakeholders, and a review and revision of contacts to ensure equitable geographic representation. Through these efforts, which included a questionnaire that was available in five different languages that asked questions about travel choices, key issues, and attitudes toward different modes of travel, MassDOT identified ten core themes that articulated the expressed concerns, needs, and aspirations of Massachusetts residents: reliability, maintenance, design, shared use, capacity, user friendly, broaden the system, funding and equity, environment and access.

For more information, see <http://youmovemassachusetts.org/> and <http://www.massdot.state.ma.us/wemove/Home.aspx>.

4. SELECT PERFORMANCE MEASURES

Selection of performance measures is closely tied to development of goals and objectives, since performance measures are used to assess progress toward meeting objectives and in turn goals. Therefore, performance measures are central to implementing a performance-based planning process, since how performance is defined and measured will significantly affect the types of projects and strategies that are advanced. Moreover, performance results inform agencies if the types of projects and strategies that are implemented are in fact helping them achieve their strategic goals.

Roles of Performance Measures

Performance measures serve five critical purposes within PBPP – they are used:

1. **Clarify the definition of goals** – Performance measures are a tool that is used in converting broad goals into measurable objectives.
2. **To monitor or track performance over time** – Metrics are used to track performance on regular basis (e.g., yearly, monthly).
3. **As a reference for target setting** – Metrics are used as the basis for selecting a target that is intended to be achieved.
4. **As a basis for supporting policy and investment decisions by comparing alternative options** – Metrics are used as a basis for comparing alternative investments or policies in order to make decisions.
5. **To assess the effectiveness of projects and strategies** – Metrics are what enable measurement to assess whether projects and strategies have worked to further goals.

Two well-known challenges associated with defining performance measures are difficulties associated with data availability and difficulties in developing quantitative measures for factors such as economic vitality and livability. Although performance-based planning and programming focuses on specific, quantifiable measures, it is not meant to discourage the inclusion or consideration of goals, principles, or policies that are difficult to measure or quantify, such as quality of life. Some key themes or lessons include the following:

- Although many State DOTs, MPOs, RTPOs, and transit agencies utilize performance measures, they traditionally have been used in different ways. State DOTs and transit agencies often have focused on measures of existing performance, and collect data to track trends in asset condition, use, or direct outcomes (e.g., pavement condition, bridge condition, revenue hours of service, transit ridership, number of toll transactions, fatalities, etc.). MPOs and RTPOs, in contrast, have often used performance measures

as a means to evaluate plan alternatives using forecasting (e.g., forecasting mode share, congestion levels, air pollution, etc.). PBPP requires both tracking progress and forecasting performance under alternative scenarios.

- In some areas of system performance, such as safety, economic vitality, and environmental quality, transportation agencies play an important role but may not be the most important factor in regard to addressing outcomes. For instance, significant causes of fatal crashes include behavioral factors such as drunk driving, speeding, and lack of seatbelt or helmet use, and factors such as vehicle safety equipment also play an important role. Similarly, in regard to air pollution and greenhouse gas emissions, vehicle technology, fuel prices, and the economy play an important role in determining the level of on-road emissions. The growing interest by policy makers and the public in linking broader issues of health, environment, housing, the economy, and other topics with transportation has raised expectation that performance considerations used in long-range planning will address integrated strategies. Therefore, in defining objectives and performance measures, there is a question of whether the measure should be defined broadly to assess system-level outcomes, or more narrowly to try to isolate the role of transportation agencies in order to provide more direct accountability. Agencies need to consider what is most important to their stakeholders, and how they will use the performance measures to prioritize strategies and to report on performance results.
- Data and tools are important considerations in developing performance measures. Data must be available for tracking performance and tools should be available to forecast performance under different scenarios or strategies.

Factors to Consider in Selecting Measures

Selecting performance measures requires considering what specific metric will be used and how measurements will be taken. In selecting performance measures, several factors should be considered:

- **Does it represent a key concern?** The performance measure that is selected should play a role in decision-making within planning and programming and relate clearly to goals established in a performance-based planning process. Many measures are available and reflect data that can be collected, but it is important to focus on selecting the few that will be most important in driving decisions. Measures should be selected carefully to reflect key concerns of the public. For example, in seeking to measure congestion, there are a variety of potential measures, such as lane miles operating below a certain level of service, vehicle hours of delay, person hours of delay, etc. The measure that is selected will have important implications on strategies that are

selected. For instance, measures of vehicle delay and volume/capacity measures of congestion will tend to favor capacity solutions; measures that focus on person-hour of delay or accessibility via multiple modes may encourage a broader set of strategies, such as bus rapid transit, bicycle infrastructure, and other options to be considered. It is important to consider tradeoffs associated with selecting different measures or using multiple measures.

Moreover, the selection of measures should address key issues, accounting for factors such as risk, importance to the public, and implications for policy. For example, system-wide pavement smoothness ratings do not distinguish heavily traveled Interstates from lesser-traveled state highways, nor crucial links from those that may have alternative routes. A selected measure, therefore, might focus on pavement quality on a subset of a state's most important roads. The relevance of the selected measure is an important consideration, given limited funding and the need to prioritize investments.

- **Is it clear?** Is the measure understandable to policy makers, transportation professionals, and the public? It is helpful to make sure that measures are clear and readily understood by the general public, avoiding technical terms if not necessary. Some DOTs have identified “storytelling potential” as a consideration in selecting performance measures, so that the measures can be used as an effective communication tool. [This concept is discussed further in Section 9 addressing performance reporting]²⁹
- **Are data available?** Transportation staff need to consider the feasibility and practicality to collect, store, analyze data and report performance information for the selected measures. Moreover, there should be a reasonable level of confidence that the data will be available for future analyses. The cost of data is also an important consideration. However, while data availability is important, it is important to also remember to not simply define the measure based on what data are readily available, but to consider what data could be collected that will best reflect issues of importance to the public and decision-makers.
- **Can it be forecasted?** Are there realistic methods to compare future alternative projects, investment approaches, or strategies using the measure? For instance, MPOs commonly use travel forecasting models combined with other tools (such as emissions models) to estimate traffic congestion, mode shares, and motor vehicle emissions. MPOs can also use crash frequency prediction methods, such as the Highway Safety

²⁹ National Cooperative Highway Research Program, Research Results Digest 361: “State DOT Public Transportation Performance Measures: State of the Practice and Future Needs.” Prepared by ICF International and High Street Consulting, September 2011.

Manual (HSM) and tools such as Safety Analyst, to quantify the effects of safety countermeasures and to help facilitate consideration of safety in planning.³⁰

- **Is the measure something the agency and its investments can influence?** A good measure does not need to be something that an agency controls. As noted earlier, most outcome-based measures of performance reflect system-wide considerations and may be influenced by many factors. At the same time, it will be important to select measures that can be influenced through policy and investment decisions in order for the measure to be useful in supporting investment decision-making.
- **Is the measure meaningful for the types of services or area?** While consistency in metrics can be valuable, it is also important to make sure that a measure is meaningful to the area or system to which it is applied. For instance, in examining investments in public transportation, DOTs often look beyond cost-efficiency measures (such as passengers per vehicle mile or operating cost per passenger) to non-traditional measures that incorporate social values. For instance, Minnesota DOT (MnDOT) specifically chose not to use ridership as one of its primary performance measures for rural public transportation but instead chose a measure tied to service hours to better reflect the primary concern about availability of public transportation service in rural areas.³¹ Care must be taken to keep the focus on customers (such as on people and

Virginia's SHSP: Focusing on the Right Measures

Virginia's SHSP, prepared in 2006, acknowledges, "In the past, the Commonwealth of Virginia has viewed motor vehicle crashes as mainly a transportation issues. Injuries and death were compared using traditional transportation-oriented measures such as the number of vehicle miles traveled (VMT), the level of congestion, or the type of facility...However, this death rate reduction has been due to increased [VMT], not from reducing the number of people injured or killed. Safety experts...are adopting a multi-perspective approach by changing from a transportation-based measure (crashes per million VMT) to a health-based measure (per 100,000 population)."

Consequently, the plan uses total deaths and injuries as its primary performance measures, rather than rates. It identifies a realistic target to "reduce annual deaths by 100 and annual injuries by 4,000 from motor vehicle crashes statewide within the next five years" by taking a multi-perspective approach, and identifies plan elements addressing a full range of strategies including driver behavior, special users, pedestrian and bicyclist safety, intersection safety, roadway departures, work zone safety, traffic records, and transportation safety planning.

Source: Virginia Strategic Highway Safety Plan, <http://www.virginiadot.org/info/hwysafetyplan.asp>.

³⁰ For more information on HSM, see: <http://safety.fhwa.dot.gov/hsm/>.

³¹ Performance Measures: State of the Practice and Future Needs." Prepared by ICF International and High Street Consulting, September 2011.

rather than facilities and vehicles) to avoid unintended consequences. It is very easy to inadvertently bias measurements by the choice of reference units.

- **Improvement direction is clear.** In some cases, agencies choose measures but do not state clearly whether they desire the measure to increase or decrease, which is particularly problematic when the measure could be interpreted differently depending on one's perspective. While the number of fatalities is a measure with an obvious preferred direction (lower), other measures such as VMT per capita may not be as straightforward.

While a decrease in VMT may indicate enhanced viability of alternative modes of travel, it can also be caused by declining economic or employment conditions. Thus, agencies should make the preferred direction clear in their publications, as well as provide justification for why this is preferred.

**Tip for Selecting Performance Measures –
Carefully Select a Limited Number of Useful and
Meaningful Measures**

The MPO for the Portland, Oregon area, Portland Metro, initially chose to track over 100 performance measures as part of its PBPP, but quickly found that collecting information on so many measures was resource-intensive and made it difficult to draw meaningful and broad conclusions regarding the system's performance. As a result, the agency identified 10 "used and useful" measures that it believes best support its specific objectives to guide its performance analysis. This may also increase the comprehensibility of Metro's performance measurement system to the general public and increase transparency.

There often can be value in using multiple measures to address multiple dimensions of a problem. At the same time, it is advisable to start with a limited number of measures since it can be overwhelming to address hundreds of different measures. Experience suggests the importance of keeping the measures simple. It has been noted in many places: "Measure what is important; do not measure everything." Traditionally, many measures used and reported by State DOTs and transit agencies reflect specific operational considerations (e.g., National Transit Database reporting measures, system usage measures) that provide useful information but may not be key considerations in relation to identified goals. Too many measures can be cumbersome to deal with, making an agency "data rich but information poor."³²

While this discussion is focused on broad system-wide performance measures, it is important to recognize that the plan level measures used to evaluate investment scenarios and implementation level measures used to inform project selection and track performance over

³² NCHRP Report 666, *Target-Setting Methods and Data Management to Support Performance-Based Resource Allocation by Transportation Agencies*. 2010.

time may not be the same. One example is a performance measure, “share of population and employment within walking distance of a transit stop,” which may be used to support a regional goal related to livability or accessibility. The Atlanta Regional Council (ARC) used this metric in its 2030 Regional Transportation Plan to compare results for the current year (2005), for 2030 without strategies suggested by the plan; and for 2030 with the implementation of the plan. However, as a system-wide level, this metric cannot directly be used for project selection, except in a qualitative way to evaluate projects that support attainment of this measure.

Building on Public Concerns

As with developing goals and objectives, it is also vital to engage the public and stakeholders in developing performance measures (in association with objectives). For some issues, such as safety, key concerns are generally well documented – i.e., reducing fatalities and injuries. For other issues, such as sustainability, livability, quality of life, and economic vitality, the most appropriate way to define an objective and associated performance measures is often unique to each state or region, so it is important to gain input from the public on what is most important to them.

Public engagement may take place through a variety of mechanisms including the public involvement aspects of the long-range transportation planning process, as well as through what stakeholders articulate at the local level, such as through corridor studies and project-related efforts. Some regions have also used public opinion surveys and social media tools to understand the priorities of the public, and stakeholder work groups as a basis for developing objectives.

As an example, the CMP traditionally has focused on traffic congestion and used engineering measures focused on motor vehicles, such as volume-to-capacity ratios. In defining appropriate congestion management objectives for a CMP, planners and decision-makers are beginning to consider questions such as: How high of a priority is traffic congestion in the region? What type of congestion is most problematic for the public and freight shippers? And what aspects of congestion are most important to address other goals, such as livability, safety, and economic vitality? Answering these questions can lead to objectives that are quite different from a traditional approach focusing on addressing level of service (LOS) deficiencies or easing vehicle traffic congestion. Moreover, given population growth, many transportation agencies recognize that reducing traffic congestion may be difficult to achieve, and that congestion may be a sign of economic vitality – as a result, some regions are focusing on improving transportation system reliability, increasing multimodal options so that people have greater choices and the ability to avoid traffic congestion, or focusing attention on strategic freight corridors or economic development corridors.

As an example, the Capital District Transportation Committee (CDTC), the MPO in the Albany, New York, region, recognized in its CMP that reducing traffic congestion was not the highest priority for the public, given limited funding to address all transportation needs. Through surveys and public involvement activities, CDTC has learned a key public opinion: the public has said that quality of life factors such as bike and pedestrian improvements, improved landscaping, and safety improvements were more important than reducing congestion in the metro area, and that travel time reliability is the most important congestion issue for travelers in the region. Consequently, CDTC has chosen to focus on “excess delay” and reliability/predictability of delay rather than aiming for free-flow traffic speeds during peak hours.³³

³³ CDTC, "The Metropolitan Congestion Management Process," May 2007, www.cdtcmpo.org.

5. IDENTIFY TRENDS AND TARGETS

While a performance measure itself provides a metric for comparison, a PBPP process requires identification of desired trends (e.g., reduce, increase, maintain) or targets (specific numerical figures) associated with the performance measure in order to provide direction to strategy analysis and performance tracking.

In order to develop a target, it is important to analyze baseline data to understand past trends in performance, as well as conduct analysis of expected performance to account for factors that will affect performance in the future, including levels of available funding. As transportation agencies go through multiple cycles and iterations of planning, the agency will have more information to develop realistic targets.

Desired Trends and Numerical Targets

Desired trends and targets may be set in different ways, across a continuum:

- **Directional (Desired Trends)** – Before developing a specific numerical target, an agency may simply identify a direction of impacts desired (e.g., reduce the number of fatalities and serious injuries, improve the on-time performance of public transportation, reduce the number of structurally deficient bridges). This step provides direction for strategy evaluation, is relatively easy to do, and serves as a starting basis for thinking about specific numerical targets.
- **Aspirational** – Aspirational targets are developed as a basis for evaluation, often prior to conducting detailed analysis. An aspirational target may also be selected to reflect a policy priority, to signal the importance of an issue, or to reflect a broader societal target, even if it may not be realistic for transportation. For instance, “zero fatalities” is an example of an aspirational target, reflecting the belief that even one fatality is too many, and so the target should reflect the ultimate aim of society. “Reduce GHG emissions by 80 percent” is another example of a target, based on information about the level of emissions that need to be reduced globally to minimize the risks of climate change, and has been established as a target by many entities prior to assessing what may be feasible or cost-effective from transportation. As a result, decision-makers should recognize what an aspirational target represents. Aspirational targets may be useful in making clear to policy makers and the public that more needs to be done to achieve ultimate aims.
- **Realistic** – Realistic targets take into account available resources, trends, risks, other competing objectives, and factors that may affect performance. They are designed to provide a basis for assessing and tracking progress in comparison to a target that is believed to be attainable.

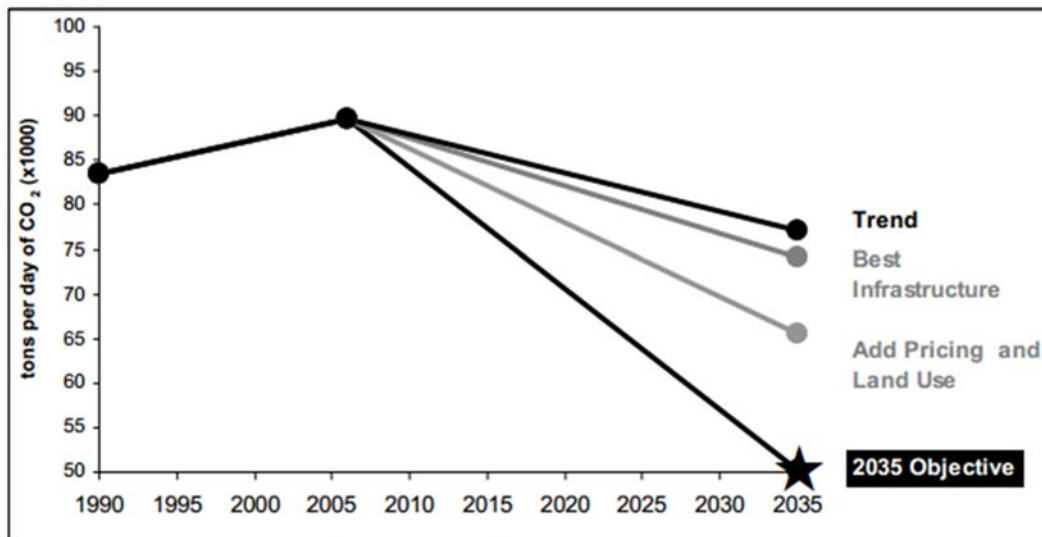
Although there is no right or wrong way to establish targets, there may be value in starting with a directional or aspirational target as overall target for society, recognizing that there are many factors that affect the ability to meet these targets and the role of transportation agencies in this context. Then, when more data are available, realistic targets may be developed. Other considerations in setting targets include whether the target should be: a specific number, a percentage reduction/increase from a baseline (e.g., to 10% below current levels), or set to a particular benchmark (e.g., to national average, to year 2000 levels).

MTC: Considering both Aspirational and Realistic Targets

The Metropolitan Transportation Commission (MTC) of the San Francisco Bay Area included a set of ambitious targets in its 2035 Transportation Plan, adopted in 2009. These targets were aspirational, and included such targets as: “reduce per capita delay by 20 percent from today by 2035,” “achieve an average age for all transit asset types that is no more than 50 percent of their useful life,” and “reduce carbon dioxide emissions to 40 percent below 1990 levels by 2035.” The Plan is notable for clearly identifying gaps between aspirational targets and expected outcomes as shown in the image below for the carbon dioxide target.

In the subsequent development of Plan Bay Area, MTC worked with the State of California to develop realistic targets in relations to requirements in Senate Bill 375, “The California Sustainable Communities and Climate Protection Act of 2008.” These targets call for MTC to demonstrate that its long range plan will reduce per-capita CO₂ emissions from cars and light-duty trucks 7% by 2020 and 15% by 2035, compared to 2005 levels.

Reduce Carbon Dioxide Emissions



Trend, Best Infrastructure and Add Pricing and Land Use values in the chart are shown in bold font in the table below.

Sources: MTC, “Transportation 2035,” http://www.mtc.ca.gov/planning/2035_plan/ and “Plan Bay Area,” http://www.mtc.ca.gov/planning/plan_bay_area/.

Time Frames for Target Setting and Planning Analysis

A target needs to have an associated time-frame associated with it, as the time-frame will help to determine what target level is feasible to achieve. Targets, therefore, may be set in the context of several analysis periods:

- **Long range.** As part of the process of developing the long range transportation performance, a target may be set for the long-range horizon period (20 or more years in the future). These types of targets may be particularly useful for metrics that change very slowly or for which there is a long time lag between policy implementation and expected effects (for instance, impacts of major transportation investments and land use changes on measures like transit ridership and vehicle miles traveled per capita).
- **Mid range.** Several State DOTs, transit agencies, and MPOs have been developing investment plans or programs that set targets and examine performance over a 10-year period. Although current Federal regulation does not require planning analysis over this time horizon, some agencies have found it useful to support their planning and programming efforts.
- **Short range.** Targets may also be set over a three to five year time horizon. These targets may be particularly useful for topic areas where transportation agencies have more direct control, such as operational considerations (e.g., on-time transit performance) and asset conditions (e.g., pavement conditions).

Desired trends and targets over the long range time horizon should form a basis for investment decision-making in planning and programming, as it is important to make sure that a program of projects does not focus on near-term improvement at the expense of long range priorities. Just as transportation asset management takes a long-range view of life-cycle costs and risks, targets used in the planning process across all key goal areas should build from those established in the long-range transportation planning process.

SFMTA: Developing Realistic Targets tied to Goals and Objectives

The San Francisco Municipal Transportation Agency’s (SFMTA, also known as “Muni”) Strategic Plan outlines clear connections between broad goals, objectives, performance indicators, and specific, time-bound targets. The agency also issues monthly progress reports that provide data on indicators for each target as well as information about what the agency has done to address each goal and related actions.

Goal 1 Create a safer transportation experience for everyone

The safety of our system, its users, and our employees is of the utmost importance to us. Creating a safer transportation experience for everyone means a secure and comfortable system for users of all transportation modes and SFMTA programs, as well as safe facilities, vehicles and areas in which to work.

Over the next six years, the SFMTA will work to accomplish this goal through programs and initiatives like meeting the Agency’s goals for achieving a state-of-good-repair for our fleet and facilities, expanding safety training programs for our employees, reducing walking, bicycle, transit, taxi, and auto incidents and accidents, and working with our colleagues and city partners to reduce crime on and near our transit system. The three objectives listed below are the main areas in which we will focus our efforts and resources. Each objective is tied closely to the others, and only with a consistent and continual effort made in each area will the SFMTA achieve the goal of a safer transportation system for everyone.

Objective 1.1: Improve security for transportation system users.

Objective 1.2: Improve workplace safety and security.

Objective 1.3: Improve the safety of the transportation system.

The performance indicators listed below are the key measures that will indicate how the SFMTA is performing with respect to this goal. We will monitor and manage many other measures to provide a comprehensive picture of how we are doing in terms of safety.

KEY PERFORMANCE INDICATORS	TARGETS		
	FY 2014	FY 2016	FY 2018
OBJECTIVE 1.1: # of SFPD-reported transit system-related crimes (i.e. assaults, thefts, etc.)/100,000 miles	Achieve 10% reduction in incidents each budget cycle		
OBJECTIVE 1.2: # of workplace injuries/200,000 hours (100 FTEs)	Achieve 10% reduction in incidents each budget cycle		
OBJECTIVE 1.3: # of preventable Muni collisions/100,000 miles	Achieve 10% reduction in incidents each budget cycle		

Source: SFMTA, *Strategic Plan: Fiscal Year 2013-Fiscal Year 2018*,

<http://www.sfmta.com/sites/default/files/FY%202013%20-%20FY%202018%20SFMTA%20Strategic%20Plan.pdf>

Process for Setting Targets

The challenges associated with setting targets are well known. Specifically, agencies are often hesitant to commit publicly to the achievement of specific targets, especially if the agency has relatively little control over final outcomes. Moreover, there are often concerns both associated with not being able to meet an ambitious target as well as setting a target that

appears too low in comparison to broad societal goals. In some cases, performance may not reasonably be expected to improve, and it is problematic to create a target that shows a worsening of conditions. For instance, particularly with limited funding, it may be difficult to achieve significant improvements in asset condition or congestion. In these cases, the analysis of the anticipated condition without the investment in projects to alleviate it should be documented to chart the impact on conditions.

Analyze Baseline Data and Develop Assumptions

Selecting a target typically involves determining baseline conditions and assessing what may be feasible given resource constraints. Baseline conditions will include past trends and current performance levels, as well as analysis to understand trends and factors that will affect future performance.

Establishing a base line or trend data is rarely as simple as measuring the most recently-available data on selected performance measures. Data should be evaluated over time so that trends or any unusual fluctuations can be identified. In addition, data on external forces should be taken into consideration as well. In evaluating how congestion has changed over the previous decade, for example, it is important to consider factors such as population and employment growth and land use changes.

Depending on the organization's resources, modeling can be conducted to develop a baseline scenario for the future, extrapolating based on current trends or information about expected changes in the future. This modeling can be relatively sophisticated. Using the example of traffic congestion, in most regions, it is likely that congestion will worsen over a 20-30 year time horizon even with investments in multimodal transportation services, infrastructure, and new operational strategies. Having an evidence-based "business as usual" scenario can contextualize outcomes for the general public, providing them with a better understanding of why performance is getting worse relative to the existing baseline conditions.

Given that PBPP is an iterative or cyclical process, performance that is monitored may become the new base line against which results from the next performance cycle are reported.

Consider Multiple Factors

Target-setting is a multidimensional process that involves various considerations, involving:

- Financial resources – Reflecting a realistic projection of what could be accomplished within available funding levels;

- Technical considerations – Targets should be achievable based on current and forecasted conditions and trends, accounting for external factors that may affect performance levels;
- Policy considerations – Reflecting existing priorities and policies, based on public involvement, customer feedback, and/or legislative or executive direction; and
- Economic factors – Considering how to maximize benefits in relation to investments, or achieve the highest return on investment.

There are several ways in which targets can be set:³⁴

- Policy-driven (established by executive management or a legislative body, which may come out of public discontent with transportation issues),
- Analysis-driven (based on modeling or other tools that provide information about expected levels of performance),
- Consensus-based (established through a collaborative planning process with input from a variety of stakeholders),
- Customer feedback-based (direct feedback from customers through surveys and outreach methods are used to help define targets), or
- Benchmark-based (through comparisons with peer agencies).

Within a PBPP process, establishing targets likely should involve some combination, particularly relying on policy priorities, analysis, consensus, and customer feedback. Understanding the available strategies being considered and that could be funded is critical to developing realistic targets. Moreover, it is important to recognize that targets may differ in different regions or for different types of facilities, reflecting the priorities of the community in relation to different performance outcomes, as well as wise investment decision-making from an asset management perspective. For instance, it may not be prudent to have a target for all bridges to be at the same level of structural condition, recognizing the difference between highly traveled connectors and less critical roadways. Moreover, it may not make sense to have the same target for transit service access in all regions.

Targets may evolve over time as additional information is gathered and performance is monitored over time. Several agencies with experience using performance measures and targets have demonstrated refinements over time. The Metropolitan Transportation Commission (MTC), the MPO for the San Francisco Bay Area, has a performance-based process that has been evolutionary during the development of its last four LRTPs, and refinements over

³⁴ NCHRP Report 666. *Target-Setting Methods and Data Management to Support Performance-Based Resource Allocation by Transportation Agencies*. 2010.

time have contributed to the development of more meaningful targets for the agency. At the state level, Washington State DOT's (WSDOT's) experience also confirms that target-setting requires a history of performance data as well as managerial comprehension and appreciation of the data, which requires time and experience.³⁵

**Southern California Association of Governments:
Using Communication Tools to Visualize Performance Outcomes**

Since 1998, the Southern California Association of Governments (SCAG) has based its Regional Transportation Plan (RTP) decisions on performance through measures and targets reflecting changing circumstances and feedback from the public. SCAG's most recent 2012-2035 RTP/Sustainable Communities Strategy (SCS) includes performance measures and target outcomes with respect to the following areas: location efficiency, mobility and accessibility, safety and health, environmental quality, economic well-being, investment effectiveness, and system sustainability. SCAG used innovative public participation techniques to communicate with and engage the public. SCAG produced visuals that depicted four possible scenarios that varied based on development location, neighborhood design, housing options, and transportation investments. SCAG identified how each scenario would impact factors such as land consumption, local infrastructure costs, vehicle miles traveled, fuel consumption, household costs, greenhouse gas emissions, building energy use, water consumption, and public health. All of these factors are related to the performance areas, each of which has several measures that have been refined over time during each of four plan update cycles since 1998.



For more information, see www.scag.ca.gov.

³⁵ NCHRP Report 666, *Target-Setting Methods and Data Management to Support Performance-Based Resource Allocation by Transportation Agencies*. 2010.

6. IDENTIFY STRATEGIES AND ANALYZE ALTERNATIVES

In a PBPP process, the performance measures and targets that are established, together with policy considerations and principles agreed upon by policy makers, should be used as a basis for prioritizing and selecting transportation investments and policies. This step relies on data and analysis tools to help support informed analysis of strategies and predict performance outcomes. This section examines how to identify potential packages of strategies to achieve performance-based objectives, as well as the data and tools used to determine which strategies may be most effective.

Strategy identification, strategy analysis, and strategy selection determine how the PBPP targets will be achieved. Primary challenges often have to do with conducting analyses of a wide range of different types of investments (capital investments in highways, transit, non-motorized modes; management and operations strategies; infrastructure preservation) across a range of performance measures. In addition, tools are limited to assess the long-range impacts of investments on some types of metrics, although they are evolving.

Some common themes from professional practice include:

- It is important to consider a full range of strategy options. Traditionally, long-range transportation planning has focused on major capital investments and has not focused on consideration of more near-term, potentially cost-effective strategies, such as demand management,³⁶ systems management, asset preservation, operations improvements,³⁷ and strategies related to land use³⁸ and driver behavior.
- Non-capacity increasing strategies are often difficult to analyze with traditional transportation modeling and analysis tools. For instance, regional travel demand forecasting models are largely designed to address roadway and transit capacity during typical conditions. Models are usually not constructed to address strategies such as incident management and traveler information. Maintenance and system preservation has historically not played a role in regional travel modeling.

³⁶ See FHWA, “Integrating Demand Management into the Transportation Planning Process: A Desk Reference,” <http://www.ops.fhwa.dot.gov/publications/fhwahop12035/index.htm>.

³⁷ See FHWA and FTA, “Advancing Metropolitan Planning for Operations: An Objectives-Driven, Performance-Based Approach – A Guidebook”, <http://www.ops.fhwa.dot.gov/publications/fhwahop10026/>.

³⁸ See FHWA, “Tool Kit for Integrating Land Use and Transportation Decision-Making,” http://www.fhwa.dot.gov/planning/processes/land_use/toolkit.cfm.

- Scenario planning can play an important role in comparing different packages of investments and strategies (including land use planning approaches). The potential for influence of external factors and the sophistication of models, however, will affect the results that these tools predict for different types of strategies, so care must be taken in interpreting results.

Identify Potential Strategies and Packages of Investment Approaches

A primary benefit of a PBPP approach is that rather than starting out by looking at project needs, the focus begins by thinking about desired outcomes. This opens up consideration of a wide range of possible strategies that might not have otherwise been considered. Options include investments in a variety of highway, transit and non-motorized infrastructure, improvements to system management and operations, and transportation demand management, as well as opportunities to partner with local governments and the private sector to address land use and economic development efforts. It is important to take into consideration the balance and interrelationship of strategies and packages of investments to ensure that strategies have an overall positive effect.

The goals, objectives, measures and targets developed in the PBPP process guide the identification of strategies by providing specificity without dictating the approach. A successful process involves analyzing goals and objectives to identify possible strategies, particularly strategies that can accomplish multiple goals and objectives. For example, incident management strategies may be effective at reducing secondary crashes (supporting a safety objective) while also reducing nonrecurring delay (supporting an objective to reduce congestion). Similarly, “complete streets” strategies that involve utilizing sidewalks and bicycle lanes may help support multimodal accessibility and environmental quality or sustainability, while also improving system operations and efficiency.

New Jersey Long Range Transportation Plan – Diverse Strategies

New Jersey's Long Range Transportation Plan, called Transportation Choices 2030 (October 2008) was developed jointly by the New Jersey Department of Transportation (NJDOT) and NJ Transit. This policy plan provides broad direction for the transportation system, identifying key goals and performance measures, and a wide range of largely non-capacity enhancing strategies. The plan includes a heavy emphasis on integrating transportation-land use planning (smart growth) to support transit, walking, and biking. It also emphasizes the importance of ITS to improve operations; facilities to move more freight by rail and policies that support moving freight during nonrush hours; travel demand management measures to shift travel out of cars and shift travel times; and strategic improvements to address bottlenecks in the highway system. Transportation Choices 2030 supports maintenance and preservation of the existing system as a priority, and continued implementation of NJDOT's ITS Master Plan, which calls for significantly expanding the number of closed-circuit television cameras, electronic message signs on the state's highways, and continually improving the NJ511 free phone and Web service for transportation information.

More information is available at <http://www.state.nj.us/transportation/works/njchoices/>.

The field of safety provides an excellent case study of how focusing on an objective to reduce fatalities, supported by a data driven approach, can help to support consideration of a wide range of strategies, well beyond traditional transportation engineering solutions. The performance-based approach incorporated into the development of a Strategic Highway Safety Plan has demonstrated the effectiveness of this approach. Transportation safety is multidisciplinary, comprised of a broad range of strategies, often referred to as the 4E's: Engineering, Enforcement, Education, and Emergency Response. For transportation planners and engineers, safety is a factor in how projects are designed and prioritized. Input from user groups, such as the elderly and teen drivers can help direct design. Law enforcement officials work to ensure traffic safety is a major part of their activities, while safe driving educators work to reduce fatalities through altering travel behavior such as intoxicated or distracted driving. Lastly, emergency response teams work with transportation planners to improve response time to incidents.

An SHSP involves collection of data on the location of crashes, types of crashes, and underlying causes of traffic fatalities in order to prioritize strategies. Knowing whether the majority of fatalities are caused by drivers' behaviors, intersection design, long emergency response times, or other factors can allow stakeholders to identify key strategies that will effectively work

towards meeting the performance-based targets. It can also help to target limited funding to the most effective improvements.

Ohio DOT's Strategic Highway Safety Plan

ODOT's SHSP notes that the SHSP "asks government agencies and safety advocates to work across jurisdictional boundaries to address crash problems regardless of where they occur." It includes a wide range of strategies, and ODOT has developed a multidisciplinary safety review committee that includes representatives from roadway design, traffic operations, and safety planning and data analysis. This committee is directly involved in project selection for projects that are funded through the Safety Program. The Systematic Signal Timing & Phasing Program (SSTPP), which was launched in 2008 and is designed to evaluate and update the timing and phasing of signal systems in congested, high-crash corridors where signal timing can be linked to crashes. The program was developed based on a number of national studies that demonstrated a link between improved signal timing and significant reductions in crashes, travel times, fuel costs, and air quality improvements.

For more information about Ohio DOT's SHSP, see <http://www.dot.state.oh.us> or contact Michelle May at Michelle.May@dot.state.oh.us.

Similarly, there are a wide range of strategies available to address accessibility, reliability, mobility, and congestion management goals. These may include transportation capacity projects (i.e. bottleneck relief projects, additional highway lanes, transit service); demand management strategies (i.e. parking management, high-occupancy vehicle lanes, and pricing), and operational strategies (i.e. traffic signal retiming, incident management, and traveler information), as well as land use strategies and other considerations. A transportation asset management approach also supports consideration of a range of investment strategies to manage physical assets over their life to support long-term sustainability.

This part of the PBPP process should begin with exploring all potential strategies. Once goals, objectives, measures and targets have been discussed, vetted, and established, agencies engaged in PBPP will have a stronger sense of the relative importance placed by the public, stakeholders, and agency officials on performance on various areas such as safety, mobility, accessibility, reliability, and asset condition. With this information, agencies begin to formulate strategies that attempt to balance these priority areas through packages of investments that reflect this balance. Based on understanding of financial constraints and risks, technical staff, working with policy decision-makers, often develop packages, or combinations, of strategy approaches for further consideration. Development of these packages should build upon data

and tools including bridge management, pavement management, congestion management, and other systems. These packages can include a range of activities including capital investments in highways, transit, and non-motorized modes, operational improvements, and other possible strategies, like land use or pricing policies and may require input from many perspectives, including transportation planners, community leaders, public, environmental specialists, landscape architects, resource agencies, public works officials, and design engineers.

PSRC: Consideration and Analysis of a Broad Range of Strategies

The Puget Sound Regional Council (PSRC), the MPO for the Seattle region, explored a wide range of strategies to meet performance objectives in its Transportation 2040 Plan, including a range of capital, operations, and pricing strategies. PSRC utilized performance measures and benefit-cost analysis in considering alternatives. Recognizing the value of road pricing to support several performance outcomes, including travel time savings, reliability benefits, and reduction in vehicle emissions, and the role it could play in funding investment needs, the Plan includes congestion pricing as a key element of its Transportation 2040 Plan with a financing plan that suggests a long-term shift in how transportation improvements are funded. The plan calls for full highway system tolls by approximately 2030.

For more information, see: <http://www.psrc.org/transportation/t2040/>

Use Data and Analysis Tools to Inform Potential Options

Data and analysis tools play an important role in prioritizing strategies as part of a PBPP process. Three primary types of analysis often are used:

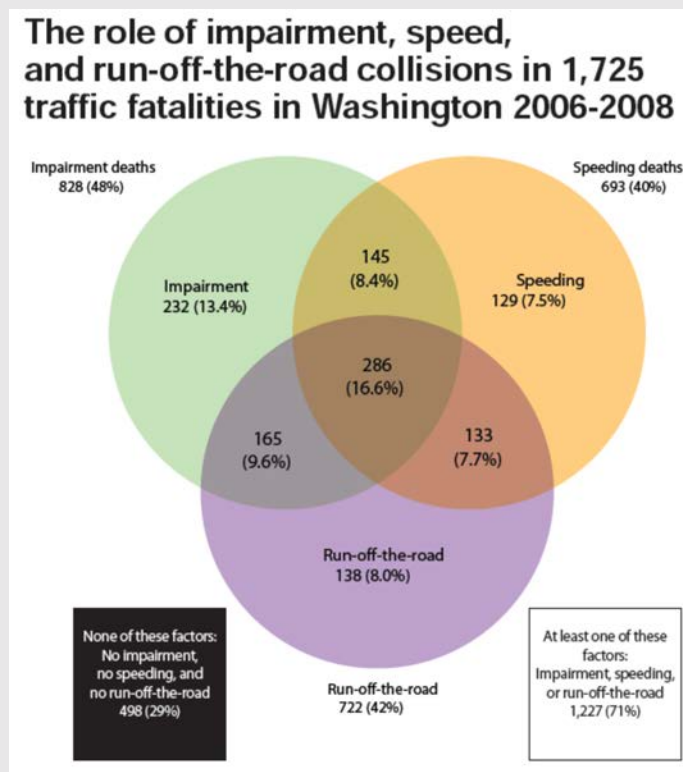
1. **Historical data:** Collecting data to understand past and existing system performance. This data can be very important for analyzing the causes of problems and in pinpointing the location of problems in order to help prioritize the types of investments and strategies that are needed. For instance, data are typically used to assess and understand the causes and location of crashes. Collected operations data is often used to understand and pinpoint congested locations as part of a CMP, and mapping congestion bottlenecks can help in assessing needs for improvements.

As an example of using data to assess system performance and to prioritize strategies, the Baltimore Metropolitan Council's Regional Transportation Board is using Inrix (a private company) data and a regional integrated traffic information system, which is an automated data sharing, dissemination and archiving system developed by the University of Maryland Center for Advanced Transportation Technology (CATT) Lab. The

Baltimore Regional Transportation Board (BRTB)'s Vehicle Probe Project ranks bottlenecks ranking through data collection based on individual vehicles, and is providing enhanced information to improve performance.³⁹

Washington State's SHSP Target Zero: Using Data to Prioritize Efforts

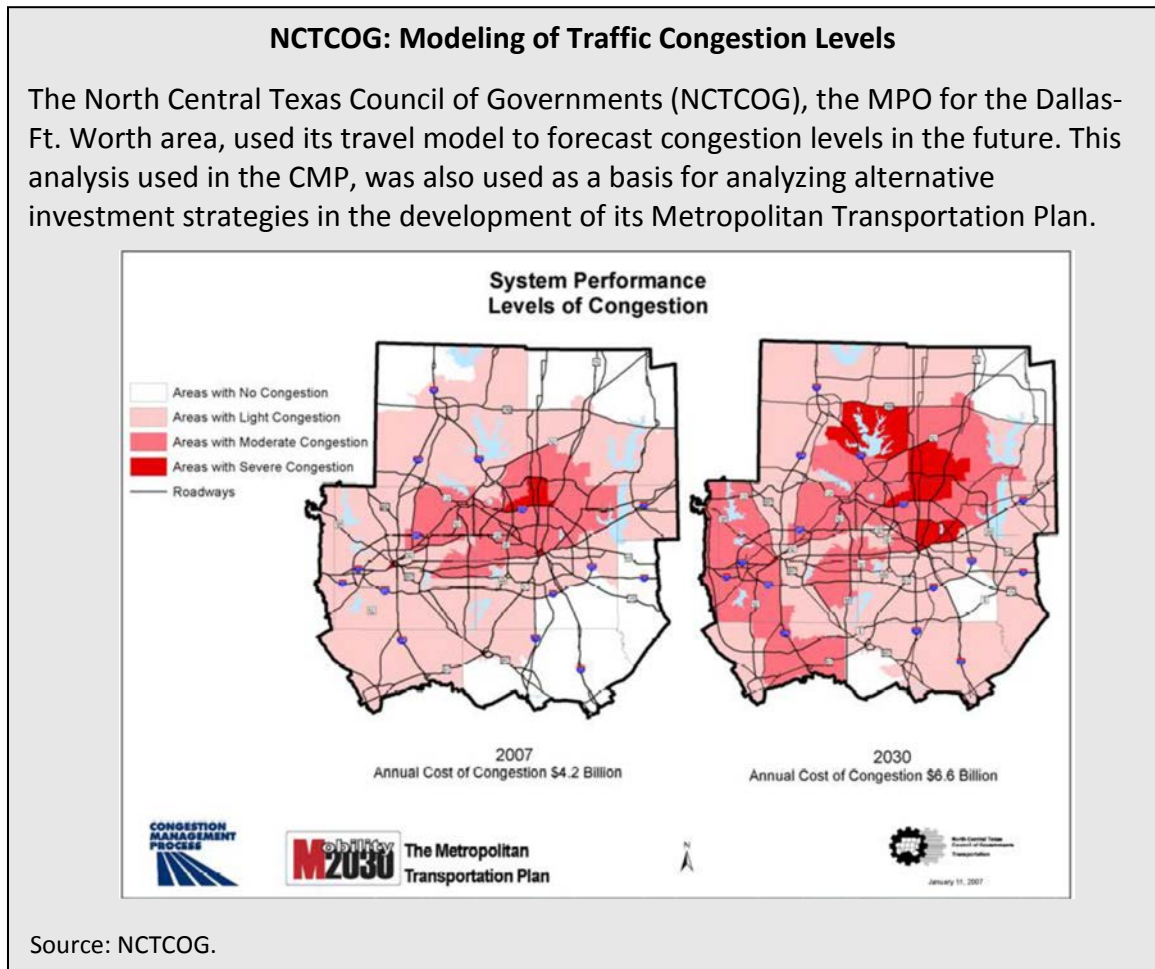
Washington State set an aggressive goal for itself: "zero traffic deaths and serious injuries on Washington State roads by 2030." While this is an aspirational goal, the coordination of stakeholders, including local governments, Tribes, state and federal agencies, the private sector, and non-profit and community groups working together has resulted in significant progress. *Target Zero* provides a comprehensive framework of goals, objectives, and strategies for reducing traffic fatalities and serious injuries, which is incorporated into the plans and programs of key traffic safety agencies. It involved significant analysis of trends in fatalities, types of crashes, and contributing factors, in order to develop priority rankings based on the percentage of traffic fatalities associated with each factor.



Source: <http://targetzero.com/PDF/TargetZeroPlan.pdf>.

³⁹ For more information on Baltimore's Vehicle Probe Project, see: <http://www.i95coalition.org/i95/Projects/ProjectDatabase/tabid/120/agentType/View/PropertyID/107/Default.aspx>.

2. **Forecasting tools:** Forward-looking analyses are conducted to assess anticipated performance of the transportation system under different future investment scenarios. The most commonly used tool for forecasting is a regional travel demand model, which can be used as a basis for forecasting vehicle travel, emissions, access to transit, and other metrics.⁴⁰



In addition, crash predictive tools and techniques allow consideration of safety impacts in planning. For instance, the HSM provides the ability to assess anticipated changes in crash frequency or severity, so for instance, if an agency is considering an access management policy on all arterial roadways throughout the community, the HSM provides crash modification factors that quantify the change in crash frequency or

⁴⁰ FHWA, “Integrating the HSM into the Highway Project Development Process,” May 2012, http://safety.fhwa.dot.gov/hsm/hsm_integration/hsm_integration.pdf. Also, see: NCHRP 546, “Incorporating Safety into Long Range Transportation Planning,” http://narc.org/uploads/File/Transportation/Library/nchrp_safety_longrange.pdf.

severity associated with changing driveway density. Therefore, the planners can estimate changes in safety performance, along with traffic operations.

3. **Economic analysis tools and management systems** – Economic models and management systems can be used to support tradeoff analysis. Examples of such tools include the Highway Economic Requirements System (HERS), bridge management systems, and pavement management systems. As an example, the Southeastern Michigan Council of Governments (SEMCOG) utilized the Highway Economic Requirements System (HERS), asset management systems, and other sources to develop relationships between investment levels and performance measures for a range of program areas (pavement preservation, highway capacity, bridge preservation, safety, transit, non-motorized, and roadway operations). SEMCOG selected a single measure in each program area for analysis, and conducted an analysis of the relationship between future performance and expenditure levels. The results were combined into AssetManager NT, a visualization tool that enables users to conduct “what if” analysis for testing different investment options. A more detailed description of SEMCOG’s process is presented in the Case Studies section (Chapter 11) of this Guidebook.

Conduct Scenario Analysis

Tied into the analysis techniques discussed above, packages of strategies can be analyzed using scenario planning, an analytical approach that provides a comprehensive framework for evaluating how various combinations of strategies, or scenarios, may affect system performance at the statewide or metropolitan level. The approach involves identifying various packages or strategies or scenarios against a baseline projection. Scenario planning is often an inclusive and interactive process – using hands-on activities, renderings and schematics to visually depict various scenarios – which can improve citizen participation and political buy-in, and result in more informed decision making.⁴¹

Within the context of performance-based transportation planning, the scenario planning approach helps visualize and articulate, in both qualitative and quantitative terms, how the combination of various strategies would help meet performance targets. It allows for the consideration of how various factors, such as revenue constraints, demographic trends, economic shifts or technological innovation can affect a state or region and its transportation system performance.

⁴¹ FHWA, Scenario Planning Guidebook, http://www.fhwa.dot.gov/planning/scenarior_and_visualization/scenario_planning/scenario_planning_guidebook/ch01.cfm

While scenario analysis may apply to State DOTs, MPOs, RTPOs, transit agencies, and other entities, federal law notes that, “A metropolitan planning organization may, while fitting the needs and complexity of its community, voluntarily elect to develop multiple scenarios for consideration as part of the development of the metropolitan transportation plan.” MPOs that choose to develop multiple scenarios are encouraged to consider [23 USC Section 134(i)(4)]:

- “Potential regional investment strategies for the planning horizon” [e.g., different packages of investments in transit, highway capacity, ITS and demand management strategies, or system preservation];
- “Assumed distribution of population and employment” [e.g., different land use patterns]; or
- Different levels of transportation funding and performance expectations, such as a:
 - “a scenario that, to the maximum extent practicable, maintains baseline conditions for the performance measures identified...;
 - a scenario that improves the baseline conditions for as many of the performance measures identified...as possible;
 - revenue constrained scenarios based on the total revenues expected to be available over the forecast period of the plan; and
 - estimated costs and potential revenues available to support each scenario.”

DRCOG: Scenario Planning to Assess Alternative Transportation and Land Use Policies

In Denver, Colorado scenario planning is used in regional planning efforts to consider the impact of both transportation and land use policies. As part of its 2035 Metro Vision plan update process, the Denver Regional Council of Governments (DRCOG) engaged in scenario modeling to determine how a variety of transportation and development policies would affect environmental, economic, and efficiency outcomes for the region. The model looked at six different scenarios, each of which had a unique combination of transportation and land use policies. Potential transportation policies included varying levels of highway and transit investments; land use policy options ranged from an emphasis on compact development to expansive development. The modeling exercise found that the scenario with compact development and an emphasis on transit resulted in less congestion, fewer VMT, greater access for low-income residents to employment by transit, and lower public infrastructure costs. The findings from this modeling exercise influenced the Council’s decision to expand the region’s urban growth boundary by less than a third of the amount it had initially considered, which will have impacts on the efficiency of transportation, as well as livability, in the region.

SANDAG: Scenario Planning Addressing Funding Levels

The San Diego Association of Governments (SANDAG) conducted scenario planning to evaluate how different levels of funding and packages of investments and growth strategies would affect performance in terms of accessibility of destinations to users of different transportation modes. Figure 5 below highlights findings in relation to accessibility measures. Comparisons such as this allow policymakers and the public to see the correlation between funding and performance and can facilitate clearer discussions of priorities based on constraints.

Figure 5: San Diego Association of Governments – Accessibility Measures

Goals and Performance Measures	Long Range Transportation Plan Scenarios				
	Current (2006)	Revenue Constrained (2030)	Reasonably Expected (2030)	Smart Growth RE (2030)	No Build (2030)
Percent of work and higher education trips accessible in 30 minutes in peak periods	61%	54%	56%	57%	53%
Percent of work and higher education trips accessible in 30 minutes in peak periods by mode					
Auto	65%	57%	58%	60%	55%
Transit	10%	13%	15%	16%	10%
Carpool	67%	64%	68%	70%	59%
Percent of non-work-related trips accessible in 15 minutes	66%	63%	63%	64%	62%
Percent of non-work-related trips accessible in 15 minutes by mode					
Auto	67%	63%	63%	64%	63%
Transit	4%	6%	7%	7%	4%
Carpool	68%	66%	66%	67%	64%

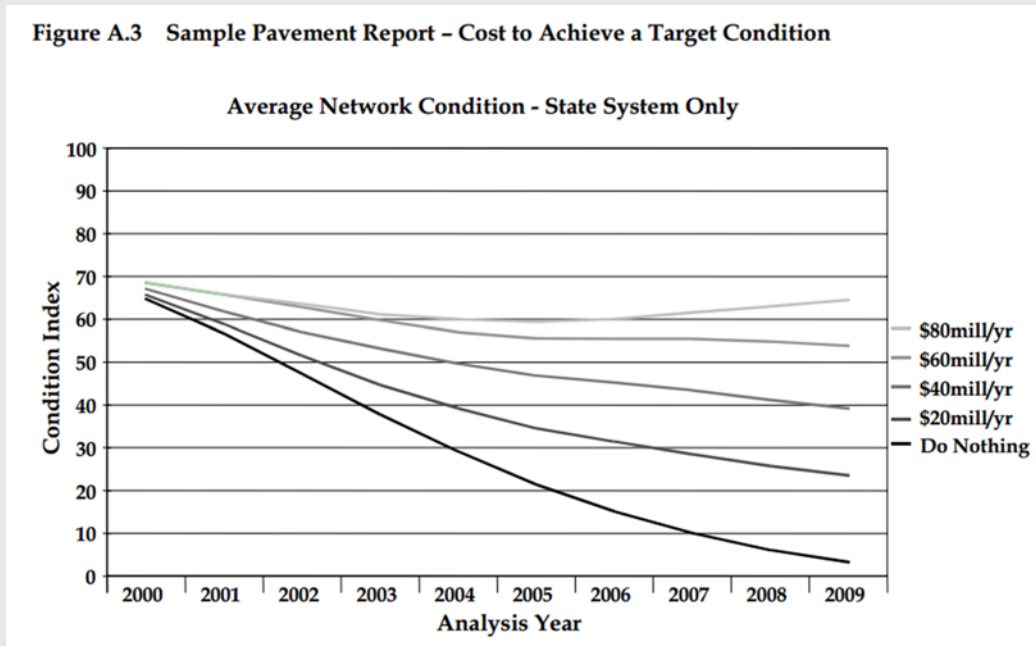
Source: SANDAG.

Scenario planning often incorporates visualization methods to depict scenarios to facilitate public engagement and improved decision-making. As an example, the Southeastern Michigan Council of Governments (SEMCOG) implemented a unique system that allows for visualization of system-level tradeoffs between possible resource distribution scenarios. SEMCOG held public meetings where maintenance costs and funding procedures were explained to the attendees to help them better understand the scenario planning process. SEMCOG also provided “investment versus performance” graphics that illustrate how current prioritization

differs from the public’s preference for goal prioritization, helping to facilitate discussions about future investments.

VTrans Asset Management Scenarios Showing Link between Funding and Performance

The Vermont Agency of Transportation (VTrans) has used scenario analysis to demonstrate a clear link between funding levels and anticipated performance on asset management. The chart below, from the Agency’s Asset Management Vision and Work Plan, compares expected results under various scenarios ranging from doing nothing (no investment) to investing \$80 million per year in pavement maintenance.



Source: VTrans Asset Management and Work Plan,

<http://www.aot.state.vt.us/planning/Documents/Planning/VTrans%20Asset%20Mgmt%20VW.pdf>.

NJTPA Scenario Planning

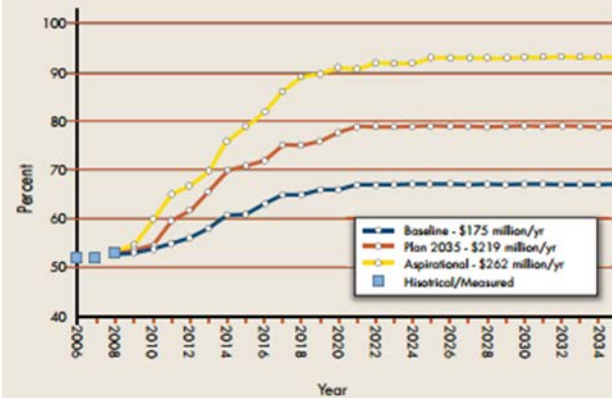
The North Jersey Transportation Planning Authority (NJTPA) engages in scenario planning to explore and understand potential and appropriate responses to changes in demographics, travel patterns, and transportation needs in the region. For its Plan 2035, NJTPA identified and evaluated three different scenarios – a baseline scenario, one based on Plan 2035, and an aspirational scenario. Each was evaluated using demographic and travel data, input from visioning workshops that were conducted as part of the plan update process, and a regional travel demand model that gauges the effect of land use and transportation choice changes.

Table 5-1
Average Weekday Indicators for Scenarios

Indicator (NJTPA region, average weekday)	2009	2035		
		Baseline	Plan	Aspirational
Auto Trips (million)	17.2	19.8	19.8	19.6
Transit Trips (million)	1.0	1.5	1.5	1.6
Non-motorized trips (million)	1.8	2.2	2.2	2.3
Average Delay (minutes per trip)	5.1	7.8	7.5	7.2
Vehicle-Miles Traveled (million)	144	165	167	164
Vehicle-Miles Traveled at Level of Service "F" (million)	25	38	37	36
Vehicle-Hours Traveled (million)	4.9	6.3	6.3	6.1

Numbers are rounded

Figure 5-1
NJTPA Region Highway Pavement Acceptability
Three Plan Scenarios



Source: NJTPA LRTP Scenario Planning,

[http://www.njtpa.org/getattachment/Planning/Plan-Update-to-2040/Plan-2035/RTP_2035_Chap5-\(1\).pdf.aspx](http://www.njtpa.org/getattachment/Planning/Plan-Update-to-2040/Plan-2035/RTP_2035_Chap5-(1).pdf.aspx).

7. DEVELOP INVESTMENT PRIORITIES IN THE LRTP

Investment priorities are made through policy-level discussions about what packages of investments will be adopted and supported for implementation by the agency. These policy discussions culminate in the development of the LRTP. This decision-making process is iterative, and may involve going back to technical staff to answer questions, re-examine options, or evaluate hybrid scenarios.

A key element of a PBPP approach is that the LRTP is founded on an understanding of anticipated performance outcomes, and consideration of tradeoffs that may need to be made across various goal areas given resource constraints. While performance measures guide investment priorities in the LRTP, other factors, such as equity and consideration of qualitative factors inform the resulting plan.

Development of the LRTP

The purpose of the LRTP document is to document the processes, data, and analyses used to make investment decisions. The LRTP pulls together information from a variety of sources, and serves as the basis for future actions. All LRTPs lay out a long-range plan for the transportation system, investments, and policies. However, there is a large amount of variation in LRTPs, particularly between those of MPOs and State DOTs. MPO plans are fiscally constrained and identify major projects and strategies that cover the time horizon of the plan. Projects are typically described in considerable detail, although certain types of projects may defer details until a later time. MPO plans typically involve travel demand modeling to assess project needs and the performance impacts of those projects, including congestion, emissions, and mode share. In contrast, State DOT LRTPs often are policy or investment documents that do not contain the specifics associated with individual projects. Some states choose projects on high priority corridors, while others allocate available funds into investment categories but not select projects. Some states maintain a unifying policy plan, and delegate project selection to subsidiary investment plans or modal plans. However, with the advent of MAP-21 both the metropolitan and statewide and nonmetropolitan transportation planning processes are enhanced to incorporate performance goals, measures, and targets – along with reporting on the overall effectiveness of performance-based planning. Also, public involvement remains a hallmark of the planning process.

Regardless of how a plan is organized—or who authors it—a performance-based LRTP will contain some basic elements:

- a) **A set of goals, performance measures, and desired trends or targets.** Taken together, they form a basis for selecting investments and policies during later components of the

L RTP. Goals and performance measures may address the 3-C planning factors and should address national goal areas. They also should reflect state or regional priorities and policy directions.

- b) **A status report of current conditions.** Status reports include an analysis of the existing system's performance. This information serves as a baseline of performance within the plan. Baseline condition analysis should include tracking of progress over several years to show recent trends in performance. This can help inform meaningful discussion of targets.
- c) **An assessment of needs.** Needs are composed of two different sets of information. The first component is the shortfall (or backlog) between existing conditions and optimal system conditions. The second component is established by comparing existing conditions with anticipated trends in population, employment, land use, and other factors. Taken together, needs reflect the investment required to bring the system to an acceptable state of performance before the time horizon of the plan. Optimal system conditions are usually in excess of the targets set by the plan. There will almost always be a backlog of needed projects and investment.
- d) **Identification of investment priorities, policies, and strategies.** The document should identify investments and strategies to be implemented to help meet performance targets that support progress toward goals. Priorities should have a clear link to the goals and objectives stated earlier in the plan. For plans that do not select individual projects, the plan should identify the amount and mix of funding within individual program areas and lay out a package of major investments and strategies.

Requirements for Long Range Transportation Plans

“A [metropolitan] transportation plan ... shall contain, at a minimum, the following: (A) Identification of transportation facilities...(B) Performance measures and targets.--A description of the performance measures and performance targets used in assessing the performance of the transportation system in accordance with subsection (h)(2). (C) System performance report.--A system performance report and subsequent updates evaluating the condition and performance of the transportation system with respect to the performance targets described in subsection (h)(2), including-(i) progress achieved by the metropolitan planning organization in meeting the performance targets in comparison with system performance recorded in previous reports; and (ii) for metropolitan planning organizations that voluntarily elect to develop multiple scenarios, an analysis of how the preferred scenario has improved the conditions and performance of the transportation system and how changes in local policies and investments have impacted the costs necessary to achieve the identified performance targets.” 23 USC Section 134(i)(2).

“The statewide transportation plan should include-- (A) a description of the performance measures and performance targets used in assessing the performance of the transportation system...; and (B) a system performance report and subsequent updates evaluating the condition and performance of the transportation system with respect to the performance targets [associated with national performance measures, as applicable], including progress achieved by the metropolitan planning organization in meeting the performance targets in comparison with system performance recorded in previous reports.” 23 USC Section 135(f)(7).

Development of the LRTP involves considering tradeoffs. Ultimately, decision-makers will need to decide which goals and objectives are most important. Since available transportation dollars are limited, resources should be chosen using selection criteria that are clearly related to the goals and objectives in the plan as well as other non-transportation factors identified by the community or required by regulation. This evaluation should be built upon performance information, as well as analysis of issues such as geographic equity, cultural preservation and environmental justice, natural environment impacts, and air quality conformity, if applicable. Asset management approaches can help set priorities by considering factors such as risk, life-cycle costs, and long-term sustainability.

Documentation of scenario analysis can help demonstrate the results of investment scenarios. This helps communicate to the public how different levels of funding could affect investment options and performance of the system.

The primary outputs of the LRTP part of the process should provide a direct connection to support project level decision making by identifying:

- Program level investment priorities;
- Major projects or priority corridors for improvement if the approved scenario included these;

- Identification and consensus on expected performance levels; and
- Policy level discussion and decisions and stakeholder input that can help inform the development of project selection criteria that are linked to the plan.

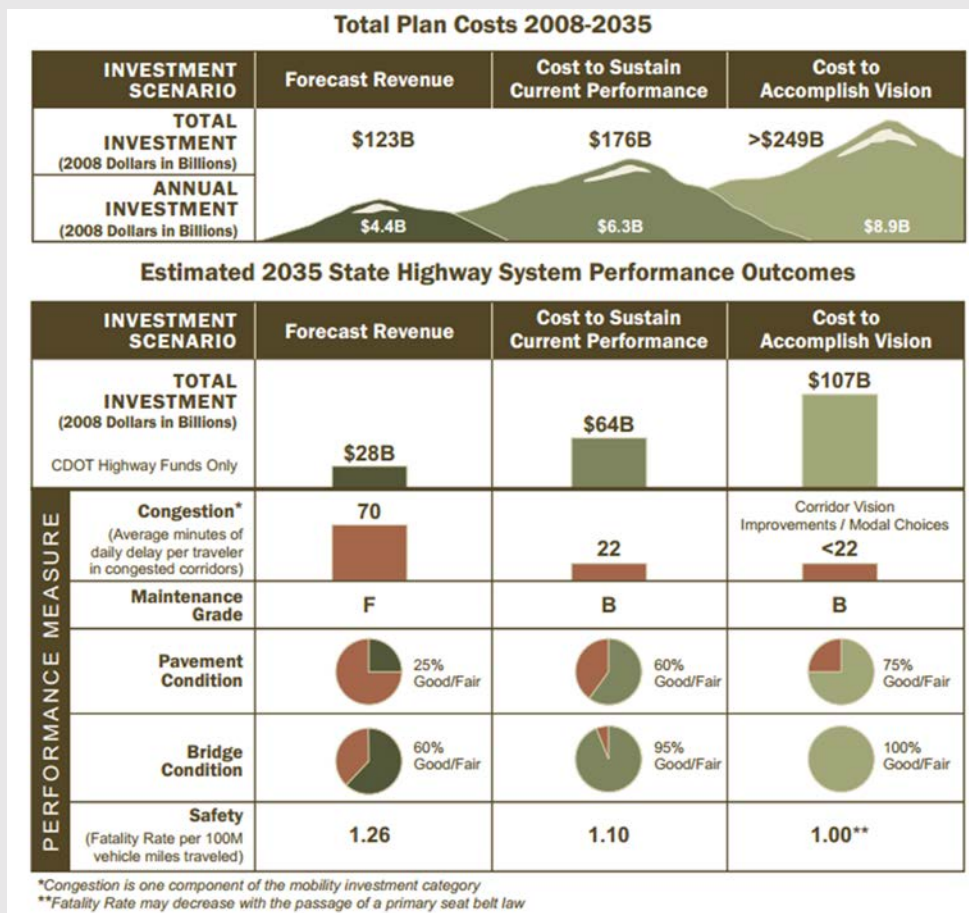
Link to Other Planning Documents

While the LRTP lays out a long-range transportation strategy and investment plan, several other planning documents are important to the PBPP process. These specific plans further define projects and programs. Examples of related planning documents include modal (highway, transit, bike/pedestrian) plans, operations and management plans, and freight system plans. At State DOTs where LRTPs have traditionally been policy-oriented, these optional planning documents are particularly important as they develop their PBPP. Federally-required performance-based planning documents include Transportation Asset Management Plans, Strategic Highway Safety Plans, and Congestion Management Processes. These performance-based planning documents should be developed within the framework of goals, objectives, and performance measures established in the LRTP. In order to improve coordination between plans, agencies should monitor implementation of these other federally-required plans, incorporate strategies into subsequent planning and programming efforts, and periodically update these plans as well.

There is a complex interplay between the LRTP and other planning documents. Each document is adopted on an independent cycle; therefore existing documents should inform the development of the LRTP. Documents developed after the LRTP should incorporate information from the LRTP. The goals and performance measures used in these plans should be coordinated. By capturing information throughout all planning documents, trends can be identified. Improving or declining performance trends can help decision-makers adjust targets, or add new ones.

Colorado Department of Transportation – Policy Plan Detailing Performance Scenarios

The Colorado Department of Transportation’s (CDOT) 2035 Statewide Transportation Plan is a broad policy plan, with more detailed information available in technical reports that were part of the 2035 planning effort. The statewide plan addresses the funding-performance link by analyzing three investment scenarios, each of which projects anticipated performance based on investment levels. For example, CDOT estimates that under the forecasted revenue scenario, pavement condition will deteriorate to only 25% of roads in good/fair condition and that congestion will increase to 70 minutes of delay per traveler. CDOT has been straightforward about its need to make difficult trade-offs and has clearly stated that safety will continue to be the main focus of its work, with other programs reduced to assure the safety of the traveling public. The plan says that to deal with shortfalls in funding that will preclude maintaining current performance levels, “CDOT needs to [invest] available dollars on only the most critical purposes, [target] only the most significant corridors, and/or [lower] performance standards, or some combination of the three.”



For more information, see: <http://www.coloradodot.info/programs/statewide-planning/long-range-transportation-plans.html>.

8. PROGRAMMING - DEVELOP INVESTMENT PRIORITIES IN THE TIP/STIP

Programming consists of resource allocation to specific projects and strategies. It is the culmination of the PBPP process, and thus plays a critical role in the PBPP approach. Under a PBPP framework, the TIP/STIP documents can serve as information rich documents that communicate the specifics of investments, their funding sources, and how they are contributing to transportation system performance improvements.

The key products in programming are the MPO Transportation Improvement Program (TIP) and a State Transportation Improvement Program (STIP). These are documents that identify projects that will be funded, the timeframe for implementation, and the sources of funding that are being committed. The STIP must incorporate projects shown in all MPO TIPs in the state, as well as transit projects. Inclusion in the STIP makes the project eligible for federal funding. Within a PBPP process, the process for selecting projects and strategies for programming should tie directly to the goals in the LRTP.

Projects and strategies can originate from:

- The list of cost-feasible projects in the MPO LRTP
- Projects shown in the State DOT LRTP
- Projects shown in the asset management plan
- Projects identified in state supporting planning documents (SHSP, state investment plan, etc.)
- From non-metropolitan regional transportation planning organizations (often known as RTPOs or RPOs)
- From transit operators, often through a transit development plan (TDP)
- From local governments
- Public “calls for projects” issued by DOTs or MPOs.

Linking Planning to Programming

Linking the LRTP to the TIP and STIP is a key step in the PBPP. Establishing a strong linkage between planning and programming has been a difficult issue for many MPOs and DOTs.

At MPOs, a pool of cost feasible projects is identified for development over the next twenty years in the LRTP. The TIP draws upon the pool of projects and prioritizes projects that will be built over the next four years. For MPOs, the programming process can involve assigning *project selection criteria* to the projects in the cost feasible plan. Project selection criteria are evaluation metrics that are used to rank projects. A performance-based LRTP will contain a narrative section that details the criteria that will be used to narrow the long-range project list into a short-range program. Ideally, the project selection criteria for the TIP will reflect those used to evaluate the needs in the plan. Once projects and strategies are prioritized based on project selection criteria, the next step is to match available funding streams to projects and strategies. By comparing funding stream eligibility to the purpose and need statement of each project, funding is matched to the highest priority projects.

As an example, the Atlanta Regional Commission developed and implemented a project prioritization method in Envision6, its RTP and TIP, which evaluates capacity expansion projects (transit, roadway, and HOV lanes) based on their environmental impact, support for regional land use policies, and ability to reduce congestion. All system expansion projects in the region's RTP were evaluated with this method based on intersection with six critical environmental areas, and data for each area was mapped and compared with the proposed projects.⁴²

To make the connections between planning and programming, the Southeast Michigan Council of Governments (SEMCOG), the MPO for the Detroit area, tracks the consistency of projects in its TIP with the investment levels identified in the LRTP. The LRTP identifies preferred funding levels for each major program, and SEMCOG tracks the consistency of actual projects programmed compared to the preferred levels.

In State DOTs, the linkage between the state LRTP and STIP is more complex. State DOTs typically have a wider pool of projects to consider in the programming phase. Further, the STIP must include projects from the TIP. State DOTs must also balance the needs of rural transportation planning organizations and transit operators. Despite these complicating factors, the linkage between the state LRTP and the STIP should be similar to that in a metropolitan area, with project selection criteria reflecting those used to assess priorities in the plan. An asset management plan is an important document for establishing the link between the agency's LRTP and the STIP.

As an example of a comprehensive approach connecting long range planning to programming, in 2009, the North Carolina Department of Transportation began a process to better ensure that projects and plans are developed, and funding is programmed, in a consistent, goal-

⁴² <http://shrp2webtool.camsys.com/Default.aspx>.

oriented manner. The Department’s “Policy to Projects” process begins with a 30-year long-range plan and concludes with a detailed 5-year work program. This new strategic prioritization and programming process uses a scoring process to prioritize projects based on quantitative data addressing factors such as congestion, safety, pavement condition, and benefit/cost associated with time savings; it also accounts for local input on rankings of projects, and assigns additional points for multimodal characteristics.⁴³

Developing an Investment Plan

Some State DOTs develop mid-range investment plans or modal plans that identify projects, programs, and strategies at a more detailed level than the LRTP. An investment plan may be developed for a specific program area, for a specific mode, or geographical area, and serve as a connection between the LRTP and TIP or STIP. An investment plan may include: identification of investment needs to address system performance and regional or community priorities; projections of expected revenues; and prioritization of investments to balance various goals, given needs and projected revenues. Minnesota DOT uses this strategy, and is discussed in the text box below.

⁴³ North Carolina DOT, <http://www.ncdot.gov/performance/reform/>.

Minnesota Department of Transportation – LRTP Performance Focus Carries through Investment Plans and Capital Programs

The Minnesota Department of Transportation (MnDOT) has integrated PBPP into a variety of plans and processes used for decisionmaking at the state level. The Statewide Multimodal Transportation Plan, adopted in 2003, focused on three strategic goals in the areas of preservation, safety, and mobility, setting clear and measurable objectives for each area. In 2009, MnDOT updated the plan with changes in performance targets based on monitoring and feedback. The policy-oriented plan provides a framework for overall transportation strategy, while specialized plans including the Statewide Multimodal Transportation Plan, System Investment Plans, Capital Programs, and biennial legislative budget request provide details about particular investments that will work to support policy goals and targets. MnDOT also has adopted several performance-based modal plans, including Freight, Bicycle, Transit, Highway Systems Operations, Highway Safety, and Aeronautics, which provide the foundation for performance-based resource allocation. For instance, each district developed a 20-year Highway Investment Plan for 2009-2028, which are derived into three timeframes: short range (2009-2012), which is incorporated into the STIP; mid range (2013-2018), and long range (2019-2028).

For more information, see: <http://www.dot.state.mn.us/measures/>.

Asset Management: State of New Jersey Statewide Capital Investment Strategy (SCIS)

The New Jersey SCIS helps decision-makers take a collaborative approach to asset management by developing investment options for transportation-asset categories using goals, objectives, and performance measures. The tool identifies investment needs in each asset category and establishes 10-year-target annual investment levels based on revenue levels and performance objectives. Most notably, SCIS links project funding selection with broad program objectives using a performance analysis that determines the potential success of various investment scenarios over time. One example of how this has worked in practice is the guiding strategies to achieve the state’s goal of eliminating fifty percent of their backlog of deficient pavements over a ten-year time frame. Using SCIS, the State recommended increased funding for a variety of highway improvements, which spurred a comprehensive pavement program with multiple treatments designed to reverse declining statewide highway conditions. Despite competing transportation needs and limited funding, SCIS has provided New Jersey with the ability to focus more on better system-wide pavement quality and less on worst-first recommendation projects.

For more information, see <http://www.state.nj.us/transportation/capital/cis/>.

Project and Strategy Selection

Historically, the process for selection of projects and strategies for inclusion in the TIP or STIP has varied widely, is often poorly understood by stakeholders and the general public, and is not well connected to planning goals. Performance based programming promises to introduce more uniformity and transparency to the programming process.

Demonstrating the connections between individual projects and system performance targets is a critical area of focus for MPOs and State DOTs to demonstrate the connections between their individual projects and system performance targets. Traditionally, agencies have first looked at available funding programs and attempted to select projects based on their appropriateness for the funding that is available. This creates challenges in that there are different restrictions on funding from different categories and different levels of federal match or involvement. A successful PBPP plan or strategy requires that the projects be prioritized based on their ability to meet desired outcomes. The key is prioritization of projects through project selection criteria based on performance measures.

Consequently, a critical link from the plan to the program is defining project selection criteria that will effectively translate the plan identified outcomes to projects actually funded and implemented. Some areas have developed “scoring” techniques or other quantitative approaches in order to combine multiple attributes to make project decisions. Examples of

varied ways in which project prioritization can be accomplished to support goals are noted below:

- The North Carolina Capital Area MPO, the MPO for the Raleigh metropolitan area, has implemented a point scoring system for projects that takes into consideration whether the project is a local priority, the level of local funding match, compliance with the LRTP, the project phase, prior funding, mode-effectiveness, and cost-effectiveness. In order to move forward, a project must obtain a score that is at least 50 percent of the top-scoring project in that mode. The MPO has found that considering the extent to which a project is a local priority allows it to identify projects that are best fits for the region. The MPO also considers specificity in scoring and project requirements, an emphasis on multi-jurisdictional projects, and the use of a uniform cost estimation methodology as important best practices learned from this system. Being open to improvement and consulting with the State DOT early and often have further enhanced the effectiveness and usefulness of the system.⁴⁴
- The North Jersey Transportation Planning Authority (NJTPA), like many transportation agencies, is responsible for reviewing numerous project proposals eligible for funding in its Transportation Improvement Program (TIP). In order to ensure that projects chosen best meet the authority's six policy goals laid out in its Plan 2035, NJTPA has developed a two-step prioritization procedure. The first step, Application of Project Prioritization Criteria, involves the evaluation (through scoring) of projects based on technical measures of how well they fulfill the goals of the Regional Transportation Plan, while the second step, Application of Additional Priority Factors, takes factors such as feasibility of project delivery, funding availability, and project timing into account.⁴⁵

Some areas start out by allocating funding to specific categories of projects designed to support the goals and priorities outlined in the LRTP. This may involve distributing funding to programs or districts using a performance-based formula and then prioritizing projects within those program areas. For instance:

- The Pennsylvania DOT has implemented performance-based evaluation criteria for funding decisions in order to support its commitment to a "fix it first" policy of prioritizing preservation and maintenance of the state's existing transportation system. As a result of the new criteria, new capacity as a percentage of the program has gone from 25 percent between 2001 and 2004 to just over 3 percent between 2013 and 2016 (projected). PennDOT established a baseline for the system by evaluating the condition

⁴⁴ Lukasina, Chris, Capital Area MPO, Presentation at CMAP Peer Exchange, July 2012, <http://www.planning.dot.gov/Peer/Chicago/chicago2012.asp>.

⁴⁵ FHWA, "A Primer on Safety Performance Measures for the Transportation Planning Process." <http://safety.fhwa.dot.gov/hsip/tsp/fhwahep09043/>.

of pavement and the percentage of segment miles in poor condition. In addition, PennDOT clearly communicated its goal to ensure that performance doesn't worsen and demonstrated that asset interventions are cost effective in order to support this goal. The new system, which includes 7 key areas of performance and defines funding scenarios in order to examine difficult trade-offs, has significantly reduced the number of structurally deficient bridges and enhanced the condition of the state's other transportation assets.⁴⁶

- The Denver Regional COG has a TIP project selection process that first involves developing funding targets for different types of projects (e.g., roadway capacity, operational improvements, reconstruction, air quality improvement projects, bicycle/pedestrian) designed to implement the objectives in the Metro Vision RTP. It then includes specific evaluation criteria for each project type that are used for scoring and ranking projects, reflecting regional goals and objectives, such as contribution to multimodal connectivity, system management, crash reduction, environmental justice, and other factors.

Other areas have utilized economic analysis tools to support analysis of alternatives. For example, Oregon DOT has explored using economic analysis approaches that account for multiple factors (e.g., benefit/cost analysis, "least cost planning") to rank project alternatives, either within individual project categories or across a set of categories.

Additional approaches include corridor approaches that develop preferred investment strategies for major corridors and then prioritize across those corridors; and optimization approaches within individual program areas (such as bridge and pavement management systems that identify sets of investments that minimize lifecycle costs).⁴⁷

Finally, some agencies use optimization techniques in specific program areas to prioritize and program projects. These techniques identify not the best projects individually, but a package of projects that maximize performance of a full program of projects subject to funding constraints. These techniques are commonly used within bridge and pavement management systems to identify a program of projects that minimizes the lifecycle cost of investments.⁴⁸ The Transportation Asset Management Plan also is meant to improve coordination between the maintenance program and the capital program, and enhance resource allocation decisions through the application of risk management techniques.⁴⁹

⁴⁶ Cessna, Dan, Pennsylvania DOT, Presentation at CMAP peer exchange, July 2012, <http://www.planning.dot.gov/Peer/Chicago/chicago2012.asp>.

⁴⁷ FHWA, "Performance-Based Planning and Programming White Paper", page 3-4.

⁴⁸ FHWA, "Performance Based Planning and Programming White Paper", page 3-4.

⁴⁹ FHWA, "Generic Work Plan for Developing a TAMP", March 2013.

Communicating the Connections to Performance

Under a PBPP process, the LRTP contains goals, performance measures, and targets, and includes investments and strategies to support meeting those targets. In the programming process—culminating in the TIP/STIP—the projects that are funded should demonstrate support for the goals and targets set out in the LRTP. By monitoring the success of the funded projects to address performance goals, a feedback loop is created for each planning cycle. Demonstrating that improvements address key performance measures, it can then be tied to projects funded over the previous four years, creating a framework for demonstrating the effectiveness of investments. Establishing and maintaining monitoring efforts between plans, projects, and tracking performance throughout the feedback cycle also results in better financial accountability and transparency.

Using technology solutions, the STIP can be transformed from a static document into one that can be formatted, searched, summarized and displayed for a variety of audiences and purposes. Moreover, using electronic technology can help to increase efficiency, improve fiscal management and coordination among the State DOT and metropolitan/regional planning organizations (MPOs/RTPOs), and streamline the document adoption and amendment process. This conversion is described as electronic STIP (e-STIP).

Whether in a paper document or e-STIP, the document can help support the selection of projects that make the link to system performance goals and communicate to the public. Specifically, the document can:

- Track consistency of projects in the TIP/STIP with investment levels identified in the LRTP;
- Provide qualitative information on the connections between projects and goals or objectives in the LRTP (e.g., by having a data field that identifies which goals projects support);
- Identify project scores or rankings conducted in order to select projects for funding (may include considerations such as benefit/cost analysis or a composite score that accounts for a range of factors);
- Provide information to enable summaries of the number and funding of projects of different types addressing different system performance factors or goals; or
- Include information on the evaluated impacts of projects in terms of performance improvements (e.g., before and after data collected).

It is important to also note that not all strategies identified in the LRTP are funded in the program – for example a land use strategy may not be implemented by the DOT and may have no money associated with it or only limited technical assistance funding. However, if these critical non-project strategies are included in the plan, they should be tracked and reported in

some way. This tracking likely will come outside of the programming document, and may be included in on-going performance reporting or progress tracking reports associated with the LRTP.

9. ON-GOING MONITORING, EVALUATING, AND PERFORMANCE REPORTING

Monitoring, evaluating, and reporting performance is a cornerstone part of PBPP. The purpose of PBPP is to ensure that results of previous investments and policies inform future decision-making so that transportation agencies can better understand approaches that work best given constraints and conditions. If data on performance are simply collected but not analyzed or used to influence future decisions, planning and programming is not performance-based. In order for performance to inform future decisions about investments and priorities, data must be collected, evaluated, and reported on an on-going basis.

Reasons to Monitor and Evaluate

- Enhance understanding of system performance and which strategies have been effective and why
- Determine whether objectives have been met through target attainment
- Inform adjustments to projects and programs based on results
- Support reexamination and refinement of objectives and targets
- Provide information to calibrate/refine planning tools

Monitoring, evaluation, and performance reporting plays a critical role throughout the PBPP planning process by providing information to inform each step.

- Information on current challenges and issues informs the development of goals and objectives.
- Information on performance trends informs development of realistic targets.
- Information on strategies implemented helps to assess the effectiveness of these strategies.

In discussing this critical element of performance-based planning and programming, it is important to make distinctions between different types of efforts:

- **Monitoring System Performance** – Monitoring is the process of tracking performance of the system, typically in terms of the goals, objectives, measures and targets that have been set in the planning process;

- **Evaluating Programs and Projects** – Evaluation is the process of interpreting results to understand the impacts that investments and policies have had on performance.

It is especially important to distinguish between monitoring system-level performance and evaluating performance of specific strategies and investments. System level performance is impacted by a variety of factors, and certain factors have a larger impact than others. The distinction is important given the limited control that transportation agencies have over some outcomes. For instance, if greenhouse gas (GHG) emissions are one measure of performance, an agency may find that GHG emissions are increasing due to factors like rapid population and economic growth. However, this does not mean that the region's transportation investments in transit, demand management, and other strategies are not having an effect. It may simply be that economic and societal trends are having a greater impact.

Understanding overall system performance should influence future allocations of resources to improve performance. At the same time, information on the efficacy or cost-effectiveness of investments and strategies should influence choices about future investment priorities. PBPP is a cyclical/iterative process, and the information gained both through monitoring and evaluating performance will inform future cycles of decision-making.

Monitor System Performance

Monitoring provides information on actual conditions on a periodic basis and allows for periodic assessment of whether targets have been or are likely to be attained. Monitoring system performance is an ongoing process, with data being amalgamated on various metrics and performance areas annually, quarterly, or even monthly or more often. Monitoring updates transportation officials with information about progress made toward goals relative to targets and resource allocation efforts.

One challenge to monitoring and evaluating performance is the difficulty of collecting data. Coordination between agencies can be especially helpful, given the vast amount of data being collected by different agencies and the role that operations data can play in providing very detailed information. Determining a monitoring strategy involves evaluation of ways to balance the need for frequent information updates with the need to use resources in the most effective manner. Monitoring plans address issues such as what is being tracked, what data need to be collected, who will collect it, how it will be collected, where it will be stored, and how it will be reported back to the end user. For instance, the CMP involves development of a monitoring plan to define the extent and duration of congestion, which defines what data will be collected

and on what elements of the transportation network.

Utah DOT: GIS-based Tool to Enhance Cooperation and Decision-Making

Rather than looking at past data to evaluate how already-chosen investments would affect its performance, Utah DOT started its most recent long range planning cycle by developing a vision based on community values. This vision shaped Utah DOT's strategic goals in key performance areas; the organization then turned to data to fulfill its vision and set targets. In this process, UDOT developed a Geographic Information System (GIS) repository, *UPlan*, an interactive mapping program that supports the department through visualization of its data, tracking assets, providing stronger analysis, and better collaboration. An immediate benefit of *UPlan* is the utilization of public data, such as census surveys and FHWA information. Using this system has saved UDOT time and resources as information and data is more easily and efficiently shared. A recent method of using *UPlan* has been to use it to support making performance-based investment decisions. Five areas of performance measurement are currently available, they include: Safety, Congestion, Economy, Environment, and Asset Management. More non-traditional measures such as greenhouse gas emissions, land use, and transit access are currently being developed. Its use by various departments has resulted in UDOT gaining a clearer vision and an improved understanding of its needs and wants, as well as enhanced communication and cooperation within the DOT and with other state agencies.

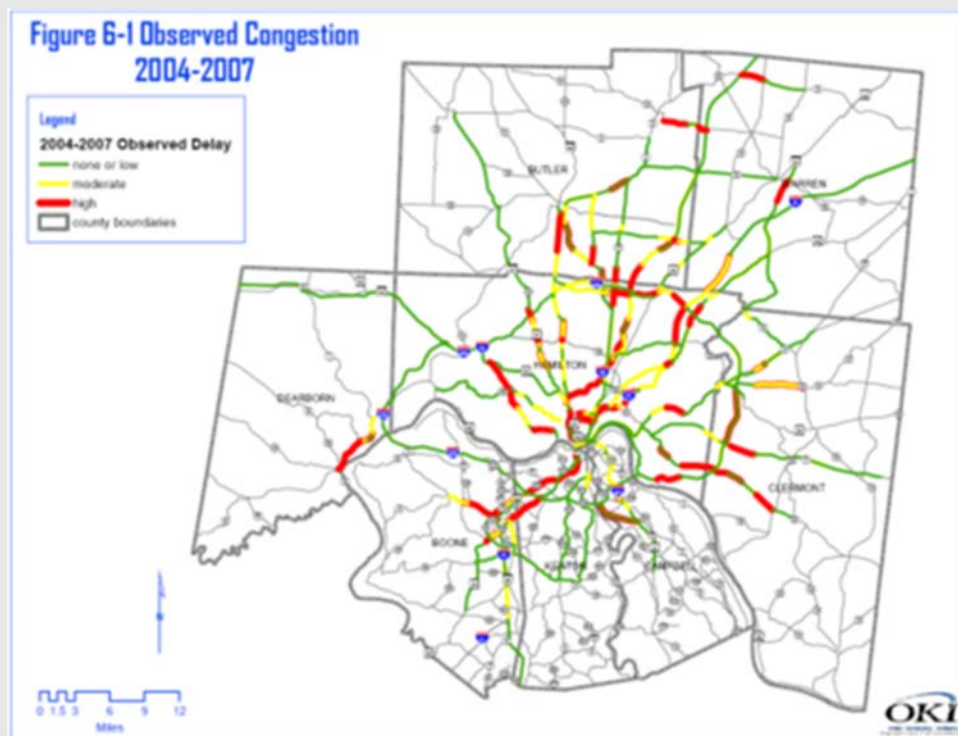
For more information, see <http://uplan.maps.arcgis.com/home/> and http://www.fhwa.dot.gov/planning/performance_based_planning/case_studies/utah/.

Determining the time horizon over which outcomes are measured is also important. Information collected on a yearly basis may be used in the consideration of adjusting the approach to achieving a particular target, while the target may remain unchanged except for during multi-year planning cycles. Many policies or investments can take years to implement fully and it may be many more years before they effect changes to travel behavior, safety and environmental outcomes, and other important goal areas. For example, it may be possible to improve safety over a few-year period, while it will take decades for land use changes to become widespread and have significant impacts on travel behavior. Thus, it is important to ensure that short-term expectations are not derived in a linear fashion from long-term targets—programs may take several years to implement and their impacts can increase over time. Supplementing data with information from departments on obstacles encountered, and

external factors affecting performance, can help ensure that these factors are taken into consideration.

OKI: Monitoring Congestion Levels within the Transportation Network

This is an example of using regional-scale maps using color-coding to display measured speed and congestion data and metrics derived from these data. This figure shows an example from the Ohio-Kentucky-Indiana Regional Council of Governments for the Cincinnati Metropolitan Area. The data is derived from travel-time surveys conducted throughout the region over a period of three years.



Source: "OKI Congestion Management Process Findings and Analysis", Ohio-Kentucky-Indiana Regional Council of Governments, 2007.

Evaluate Program Effectiveness

Evaluation goes a step beyond monitoring and tracking and attempts to understand whether implemented strategies have been effective in contributing toward positive performance outcomes. Two types of evaluation may be conducted:

- (1) **System-level performance evaluation** - Regional analysis to assess the extent to which transportation investments and policies have contributed toward a target;

(2) **Project-level or program-level analysis** of conditions to assess impacts of specific strategies.

One approach to evaluation is for an agency to fund studies to measure the effectiveness of particular strategies or projects by examining conditions before and after, or with and without, a strategy of interest. For instance, a study could be conducted to quantify vehicle-miles-traveled (VMT) reductions or mode shifts of a transportation demand management (TDM) program, to quantify the speed improvements associated with traffic flow improvement projects, to examine the reduction in vehicle delay associated with operational strategies, to assess the lives saved through a safety campaign, or other similar types of impacts.

One example of a program evaluation includes efforts by the National Capital Region Transportation Planning Board (TPB) in the Washington, DC region to quantify the effectiveness of its Commuter Connections TDM program. TPB conducts a regional State of the Commute Survey, along with additional surveys such as a Guaranteed Ride Home Program survey and tracking of participation rates in programs, in order to analyze the vehicle travel reductions and air quality improvements associated with the program.⁵⁰ The North Central Texas Council of Governments (NCTCOG), the MPO for the Dallas-Ft. Worth area, has conducted evaluations of its Thoroughfare Assessment Program, which involves retiming traffic signals on major corridors. An extensive data collection and system analysis process occurs for selected thoroughfares by means of assessing operational characteristics; estimating air quality benefits; and using performance measures such as travel time, delay, speed, and number of stops in order to develop and implement improvements. The results demonstrate reductions in travel delay and emissions.⁵¹

Another approach is for an agency, such as an MPO, to develop guidance for evaluating strategies, and require local project sponsors to conduct evaluations of their projects and programs. Guidance can be provided on when an assessment should be done, what measures should be used, how data should be gathered, what methods should be used to analyze the data, and other aspects of evaluation studies. This approach is appropriate where partner agencies are responsible for implementation of CMP strategies, or where the MPO does not currently have sufficient resources to conduct studies. The East-West Gateway Council of Governments in St. Louis, Missouri provides guidance to localities on when a focused evaluation of strategy effectiveness is warranted, and how to conduct them. For example, if little is known about the actual benefits of the project, effectiveness evaluation can determine whether such

⁵⁰ See for example TPB and MWCOG, “2007 State of the Commute Survey Report,” June 2008, www.mwcog.org.

⁵¹ See for example Kimley-Horn and Associates for NCTCOG, “Thoroughfare Assessment Program Phase 2.0,” July 2009, www.nctcog.org/trans/tsm.

strategies should be implemented more broadly (e.g., a trip reduction program that has not previously been used in the region), or if changes are required in the implementation of the strategy to produce the desired benefits.⁵²

Evaluation: NJTPA – Guidebook on Project Performance Measurement

The North Jersey Transportation Planning Authority (NJTPA) has created a Guidebook for Project Performance Measurement, which provides guidelines to the agency for evaluating the impacts of strategies chosen to inform future selection of packages of investments. The Guidebook addresses the use of various types of measures, both quantitative and qualitative, to evaluate investment decisions, while also noting the challenges to project-level evaluation. The Guidebook also delves in some cases into detailed instructions about how to evaluate various types of projects based on the mode(s) involved and performance area.

For more information, see: <http://www.njtpa.org/Planning/Regional-Studies/Completed-Studies/Performance-Results-Assessing-the-Impacts-of-Imple/PerformanceResults.aspx>.

Report Performance Results

The way in which information about system performance in comparison to targets is communicated to policymakers and the public can have significant implications for support for an agency and its funding. It is important that public reporting of performance be done in a clear and concise manner. State DOTs, MPOs, RTPOs, and transit agencies across the board are feeling the pinch of fewer and fewer resources for quickly expanding needs more than ever. Reporting performance in a way that emphasizes the link to funding levels can be especially important for some agencies. Although this is done in scenario planning for forecasting investment impacts, reporting on funding shortfalls in relation to system performance deficiencies can provide an even more concrete way to demonstrate linkages. Historical performance information (such as the effect of inflation on fixed revenue streams) can also provide context for results.

Transportation organizations communicate performance results to a number of different audiences. First, the organizations collect and analyze data and circulate performance results internally. In addition, they report results both to the general public and to leaders and policymakers. In the case of the public and policymakers, simple graphics, visuals, and dashboards are very helpful in communicating information in ways that the public can

⁵² “St. Louis Region CMS Congestion Mitigation Handbook,” February 1998, <http://www.ewgateway.org/pdffiles/library/trans/cmshandbook.pdf>

understand, rather than simply reporting out data. To the extent possible, visuals should show past performance to provide context for current results. In addition, where appropriate, the organization can also provide counterfactual information, for example, about performance that would have been expected without the investments that were made. This can be particularly relevant for congestion; although in many areas congestion is worsening due to population growth, it is likely that investments in transit and demand management may have slowed the rate at which congestion has gotten worse.

In terms of communicating to policymakers, transportation officials can use reporting data to show the link between funding levels and performance, as well as the long-term cost savings of investing in infrastructure now to prevent costly repairs down the road.

There are a number of ways to clearly communicate performance results to the public, many of which are highlighted in the following discussion. Dashboards, which have an interface similar to an automobile dashboard, and scorecards, are designed to be easy to read. A common element of these methods is a clear display of information that communicates effectively.

The concept of “performance journalism” has been used by some agencies, notably the Washington State DOT, in order to clearly communicate information about performance. Performance journalism is the combination of quantitative reporting using charts, tables, and measurements, along with narrative storytelling. The goal is to share the performance of the agency’s complex and diverse programs and projects clearly and concisely in a format that the public can easily understand. Key principles of performance journalism include:⁵³

- Good writing – Use clear, concise, language that is understandable and free of industry jargon.
- Good data – Since data forms the basis for reporting performance, it is critical that the organization pursue data integrity and quality, and address issues of incomplete data or limitations in data.
- Good graphics – Graphics should be easily understood by the reader.
- Good format and presentation – The design of a report should entice the reader to engage with the material, allow a quick grasp of the message, and employ a reader-friendly layout.


⁵³ Washington State DOT, “Bridging the Gap Between Agencies and Citizens: Performance Journalism Offers a Practical Solution to Communicate Performance Results,” by Daniela Bremmer and James H. Bryan, Jr.

- Good timing – Information should be timely and cover issues of importance to the community.
- Tell stories – Rather than simply presenting data, develop a story of when things have gone right or wrong, and why.

California DOT’s Regional Progress Report⁵⁴ is part of an ongoing state effort to understand the intersection between land use, mobility, housing, infrastructure and natural resources preservation as they relate to a region’s economic vitality, quality of life, and environmental quality. In 2007, the first California Regional Progress Report introduced regional quality of life indicators based on Regional Blueprint Planning goals. The 2010 Report builds on the foundation laid in 2007, but expands upon it to help meet the state’s need for coordinated sustainability planning and assessment.

CUUATS Report Cards

The Champaign Urbana Urbanized Area Transportation Study (CUUATS), the transportation division of the Champaign County Regional Planning Commission (CCRPC), the MPO for the Champaign-Urbana metropolitan area, has adopted an objectives-driven approach to its transportation planning. In its recent plan, Choices 2035, CUUATS identified 12 regional goals and specific objectives to support each. The plan identifies measures of effectiveness in tracking progress toward each objective and uses them to determine whether objectives were met in tracking its performance. This has led to increased public engagement, greater accountability, safety improvements, and enhanced bicycle infrastructure in the area. Below is an example from CUUATS’ LRTP 2011 Report Card, which identifies each goal, corresponding, SMART objective(s), Measures of Effectiveness (MOEs), and periodic performance updates that CUUATS uses to track its progress in accomplishing its goals.



This MOE receives a negative rating because data suggest a decrease in roadway safety resulting in more fatalities per 100M VMT.

Table 6.8 Fatalities per 100M VMT MOE Summary

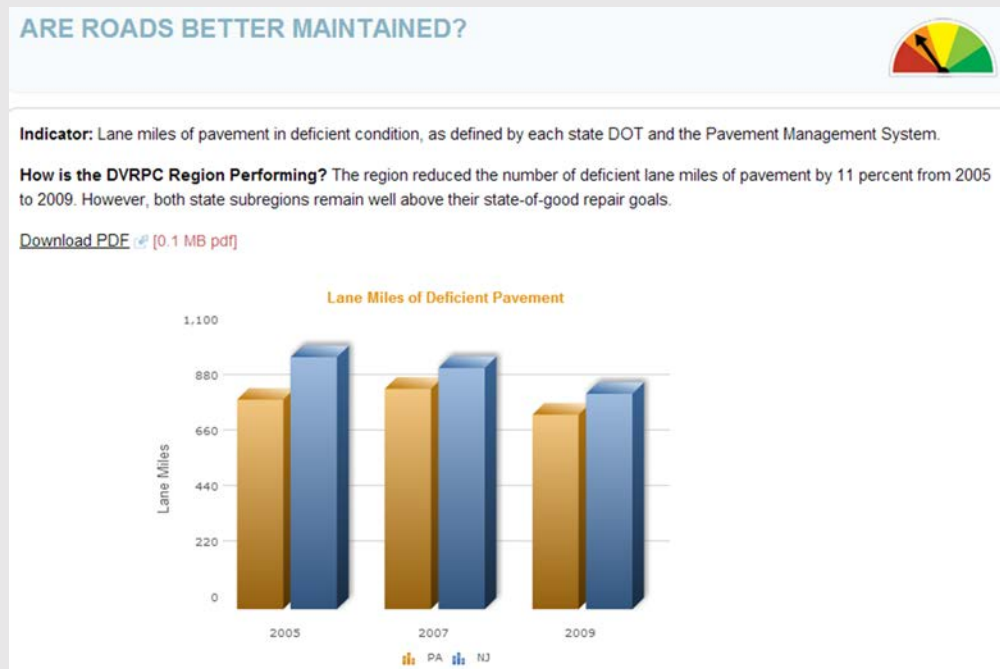
Goal	3. Transportation modes and facilities in the urbanized area will be safe for all users
Objective	Reduce the total number of fatalities and severe injuries in Champaign-Urbana by 25% between 2009 and 2014.
MOE	Total Fatalities per 100M VMT
Status	50% increase in fatalities per 100M VMT - Negative Rating.

Source: CUUATS, <http://www.ccrpc.org/transportation/>.

⁵⁴ 2010 California Regional Progress Report, http://www.dot.ca.gov/hq/tpp/offices/orip/Collaborative%20Planning/Files/CARegionalProgress_2-1-2011.pdf.

DVRP Tracking Progress Reports Communicate Clearly

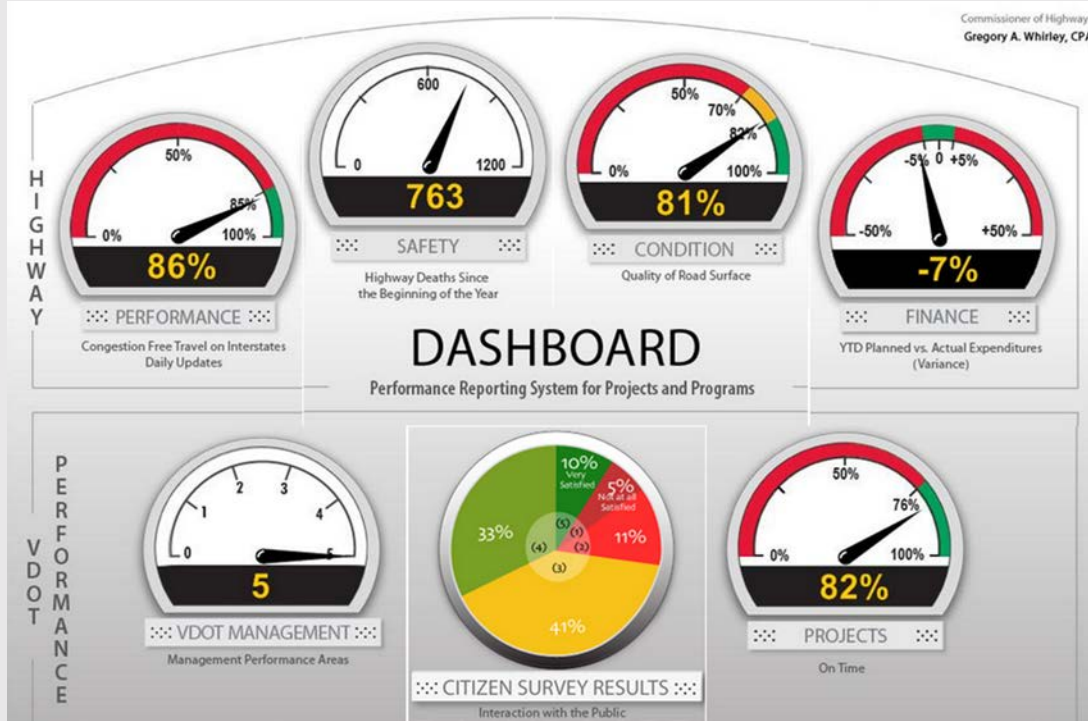
The **Delaware Valley Regional Planning Commission (DVRPC)**'s "Tracking Progress" report on achievement of targets in LRTP with focus on encouraging public engagement. The report uses engaging graphics such as "dashboard indicators" to convey performance on a variety of measures. The Commission's easy-to-understand indicators are explained, and the site provides a concise explanation of performance along with visuals and links to more information for readers interested in honing in on performance in a particular area. The Commission, whose territory encompasses multiple states, also differentiates performance based on jurisdictional boundaries.



Source: DVRPC, Tracking Progress,
<http://www.dvrpc.org/LongRangePlan/RegionalIndicators/Transportation.htm>.

VDOT Interactive Online Dashboard

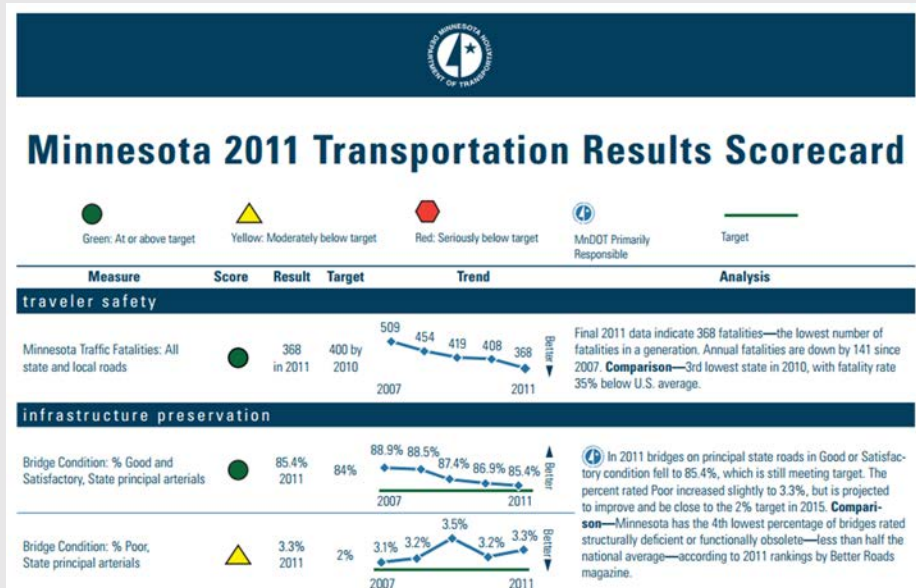
The Virginia Department of Transportation (VDOT) has developed an interactive online dashboard to clearly report its performance to the public. The dashboard can be used to navigate to greater levels of detail for each performance area. The dashboard is available and comprehensible to anyone interested and clearly identifies the indicator and results. In addition, it provides links to public participation and survey results.



For more information, see <http://dashboard.virginiadot.org/>.

Minnesota Department of Transportation – Transportation Results Scorecard

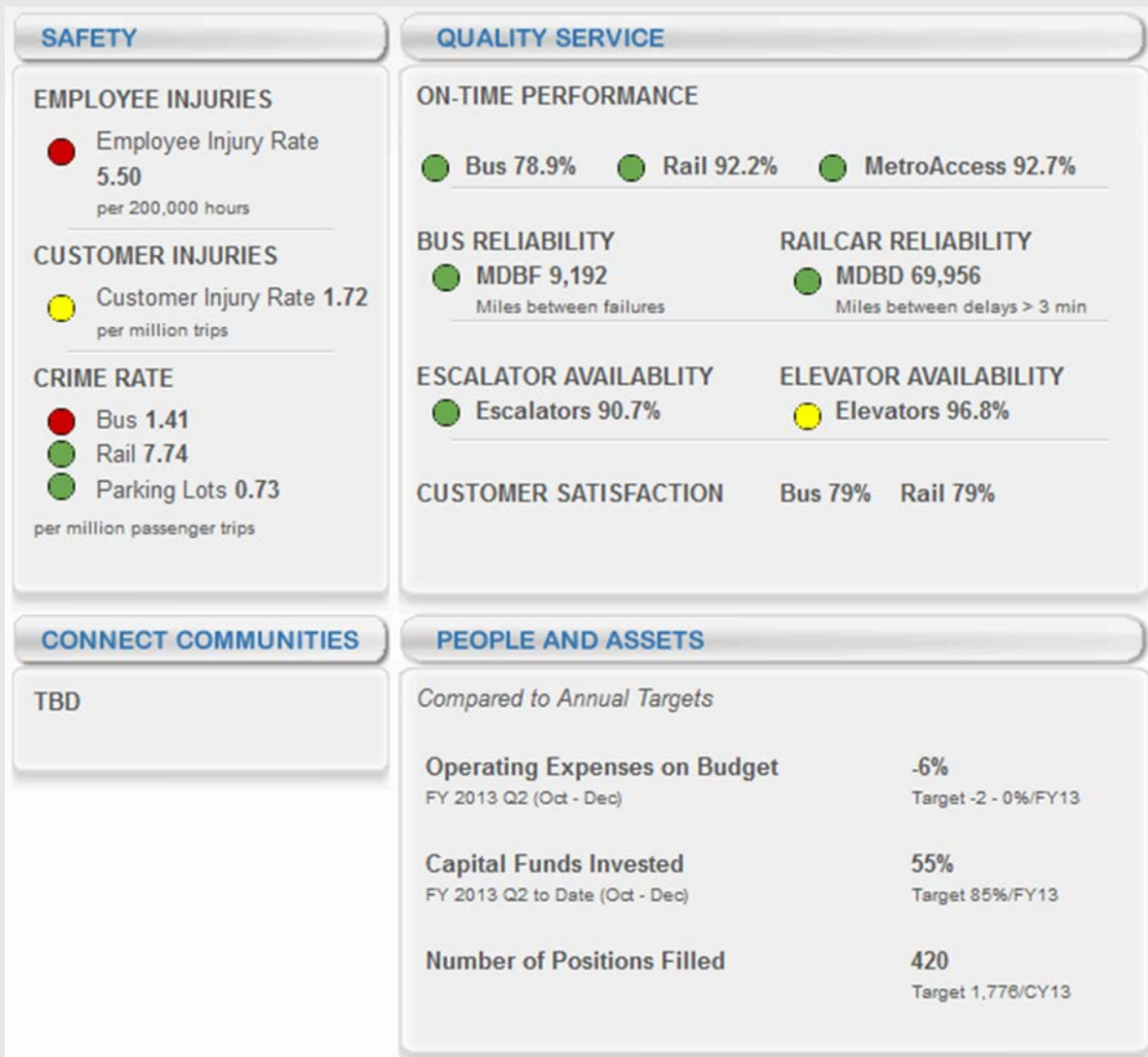
MnDOT has been recognized for the presentation of its projected and actual performance on a variety of measures using a combination of colors and symbols that are easily comprehensible to the general public. The Annual Transportation Performance Report provides an overview of system performance and the Scorecard condenses this information into easy-to-understand graphics and assessments.



For more information, see: <http://www.dot.state.mn.us/measures/>.

WMATA Vital Signs Report

The Washington Metropolitan Area Transit Authority (WMATA) created an Office of Performance in 2010 to ensure the incorporation of performance measures into its decision-making processes. Performance results from the Office's *Vital Signs Report* are used by the General Manager to inform his Execution Plan and focus staff resources. Tracking performance has also enabled WMATA to present its Board of Directors with various scenarios of predicted performance based on the level of investment in both performance and customer/demand projects. WMATA has also created an interactive Metro Scorecard, which is easily accessible online and provides a broad overview of performance in the key areas of safety, security, reliability, and budget performance. In the *Vital Signs Report*, results for each indicator are provided along with a discussion about: the reason the indicator is used to track performance; why performance has changed; trend data; and actions the agency is taking to improve performance.



For more information, see: http://www.wmata.com/about_metro/scorecard/index.cfm.

10. KEYS TO SUCCESS

Performance-based planning and programming builds upon existing transportation planning and programming activities, informed by data, and focused on performance outcomes. While agencies are at various levels of experience in using performance-based approaches to make long range and short range decisions, some key points for moving forward are noted below.

- **Measure what matters:** Focus on outcomes that are important to the public. It has often been said: measure what is important, do not measure everything. Engage the public and stakeholders early and often in performance-based planning. Goals and objectives that guide decisions in a long range transportation plan should be described in terms of outcomes experienced by users (for example, travel times, reliability, fatalities, etc.), as these are the types of outcomes the public cares about. Rather than adopting simple metrics to assess traffic delay and pavement condition, some organizations have chosen to go beyond and ask questions such as, which types of congestion are most problematic, what types of assets are most critical, etc. Public engagement is critical to identifying the issues that residents care about most, and may involve use of surveys, public meetings, focus groups, or other activities. State DOTs, MPOs, RTPOs, and transit agencies are continually improving their outreach techniques by leveraging existing social media technologies and other online tools, as well as technologies that allow for polling in community meetings.
- **Select a limited set of measures:** Carefully select a comfortable number of performance measures. Rather than monitoring hundreds of measures, it can be preferable to identify key measures that are “used and useful” to best support goals and guide performance analysis. An agency may start with national measures as well as a few key ones that are important for the community. In selecting performance measures, key questions to ask include:
 - Does it represent a key concern?
 - Is the measure clear?
 - Are data available for calculating the measure?
 - Can it be forecasted?
 - Does it measure something the agency and its investments can influence?
 - Is the measure meaningful for the types of services or area?
- **Build on existing performance-based planning processes:** Build on already-established performance-based approaches to other federally-required planning activities, such as State Asset Management Plans, State Strategic Highway Safety Plans (SHSPs), MPO

Congestion Management Processes (CMPs), Transit Agency Asset Management Plans, Transit Agency Safety Plans, and optional State Freight Plans.

- **Consider the big picture and tradeoffs:** While a PBPP is intended to be data-driven, recognize that planning cannot be driven solely by performance data and purely quantitative methods. Performance measures are not intended to replace factors such as equity, environmental justice, and quality of life concerns that may be difficult to quantify. Especially in the development of the long-range plan, policy- and decision-makers must consider tradeoffs. Resources should be allocated based on an understanding of performance outcomes, and the public's priority placed on multimodal balance, geographic and political distribution, cultural preservation and environmental justice, natural environment impacts, air quality conformity, and other considerations. Moreover, it is important to focus not only on specific performance indicators, but to consider the long-term investment and asset management context, including factors such as life-cycle costs, risk assessment, and sustainability of solutions. Identifying the ways in which each measure connects back to broad goals and priorities is important for communicating results in a way that is meaningful to community leaders and constituents, who generally discuss issues and concerns with the agency in qualitative terms.
- **Coordinate and collaborate across agencies.** Coordination is a critical element of PBPP, across many dimensions:
 - Across policy, planning, and programming within an agency – to ensure that desired goals and performance focus are consistent across a wide range of program- and subject-specific plans (e.g., safety plans, congestion plans, asset management plans, operations plans) and that the goals, and key measures in the LRTP provide direction to these documents.
 - Across transportation agencies – For PBPP to be successful, State DOTs, MPOs, RTPOs, and transit agencies should coordinate in regard to developing goals and objectives, measures, and targets. While unique factors will affect what is important for each context, there should be a common thread of support for common goals across the various transportation plans.
 - Across multiple partners and stakeholders – Transportation agency investment decisions affect performance of the transportation system, but so do decisions made by local governments, the freight community, and many other stakeholders. Moreover, broader societal outcomes related to the economy, environment, public health, and accessibility are influenced by a range of forces, and so partnerships are important for achieving desired outcomes.

- **Communicate successes and constraints.** Communicate performance in terms that are readily understood by the public and decision-makers. Moreover, an important component of reporting is to highlight the constraints (e.g., funding limitations, external factors) that affect performance outcomes. Transportation officials can use reporting data to show the link between funding levels and performance, as well as long-term cost savings of investments to prevent future costly repairs. This is just one example of the ways in which transportation agencies can use data and performance information to guide or influence decision-making, especially when it is controlled by another political entity.
- **Tell a story rather than just releasing data.** Similarly, releasing performance information and data to the public or other constituencies should be seen as an opportunity for an agency to “tell its story” and provide context for performance outcomes. If performance improved, this is an opportunity for the organization to explain the actions it took that it believes led to this improvement; if performance worsened, it is important to explore the factors that contributed to this outcome and explain them to the public, as well as explaining any actions the agency plans to address it.
- **Performance-based planning and programming requires dedicated resources.** Tracking performance on a variety of measures, reporting performance, and re-evaluating strategies and targets based on performance information requires dedicated resources, particularly in terms of staff time and data collection and analysis. Agencies interested in implementing a performance-based approach to planning and programming should consider their capacity to devote resources to these activities and identify the level of effort the agency can spend on implementing this approach.
- **Consider the role transportation plays in achieving goals in a variety of areas.** In many cases, transportation serves as a means to an end rather than just an end in and of itself. Most transportation agencies’ missions mention broad goals such as improving the quality of life and enhancing economic opportunities for residents. As such, it can be helpful for transportation officials to keep this in mind in identifying key goal areas and “measuring what matters.”

11. CASE STUDIES

This section includes case studies of a diverse set of agencies that are using elements of a performance-based planning and programming approach:

- Minnesota Department of Transportation (MnDOT)
- Southeast Michigan Council of Governments (SEMCOG)
- Champaign Urbana Urbanized Area Transportation Study (CUUATS)
- Washington Metropolitan Area Transit Authority (WMATA)

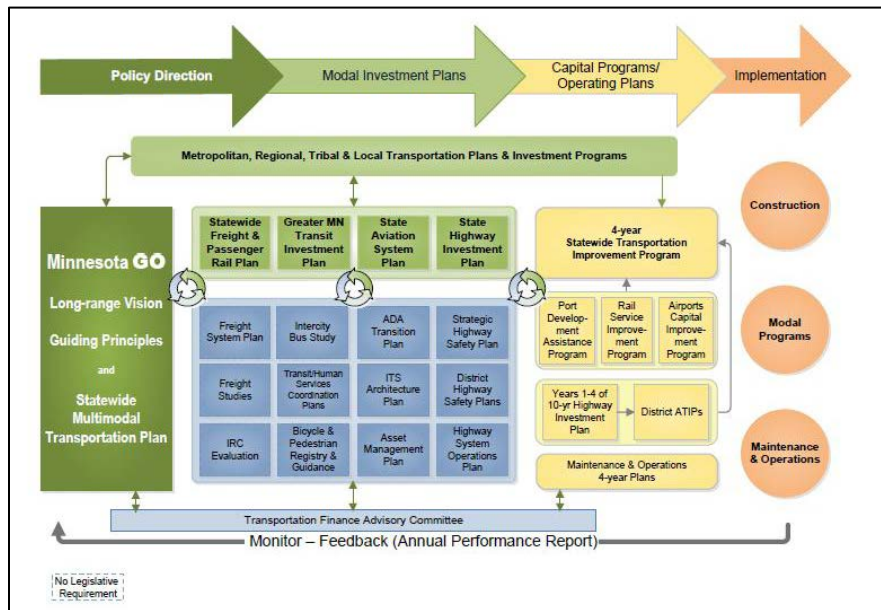
These examples highlight how State DOTs, MPOs of various sizes, and transit agencies can begin to incorporate a PBPP approach into their decisions, and how the various components of a PBPP approach – setting goals and objectives, selecting performance measures, setting targets, analyzing strategies, and evaluating results – tie together.

Minnesota Department of Transportation

The Minnesota Department of Transportation (MnDOT) integrates performance management into planning, programming, and project selection through a Family of Plans (Figure 4) that includes:

- The ***Statewide Multimodal Transportation Plan (SMTP)***. This plan, which is updated every four years, describes statewide policy objectives and strategies designed to help MnDOT and its partners make progress toward the Minnesota GO 50-year Vision for Transportation. Each SMTP objective is accompanied by a performance measure or collection of performance measures that track the effectiveness of SMTP strategies.
- ***Modal investment plans***. These plans – which include the Greater Minnesota Transit Investment Plan, the State Aviation System Plan, the Statewide Freight & Passenger Rail Plan, the 20-year Minnesota State Highway Investment Plan, and a collection of supporting plans – use measures and targets to assess system performance, identify needs, and establish spending priorities. MnDOT’s modal investment plans are updated every four to six years.
- ***Capital programs***. The Statewide Transportation Improvement Program (STIP) documents projects to be funded and delivered over the upcoming four years. Annual updates of the STIP allow MnDOT to make 4th year programming decisions based on new plan strategies, investment priorities, and reports on system condition and performance.

Figure 4. MnDOT Family of Plans



The 20-year Minnesota State Highway Investment Plan (MnSHIP)

The most mature application of performance-based decision-making within MnDOT’s Family of Plans is the 20-year Minnesota State Highway Investment Plan (MnSHIP), which links SMTP policies and objectives to a set of fiscally constrained investment strategies that guide capital improvements on the state highway system. In the past, MnSHIP and its precursors have employed performance measures,

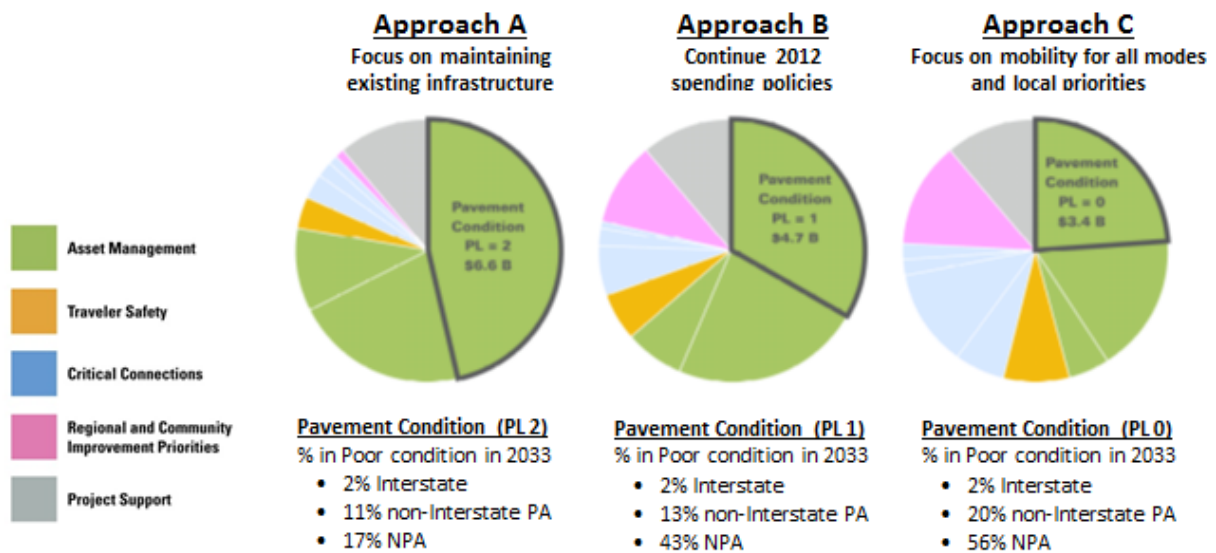
targets, and predictive models to express MnDOT’s aspirational performance goals and describe the gap between desired and anticipated fiscally constrained outcomes in major investment areas. The next iteration of MnSHIP, due out the summer of 2013, is further advancing the use of performance management techniques through a scenario-based planning process that encourages stakeholders and decision-makers to consider cross-cutting risks and performance trade-offs when setting investment priorities.

Using performance information to set investment priorities

A key role of performance information in MnSHIP’s scenario-based planning approach is to support the development of “performance levels.” Similar to levels of service, MnDOT uses performance levels to signify a set of strategies, outcomes, and risks associated with a given level of investment in one of ten distinct investment categories. As proposed investment in a category increases, that category’s performance level is adjusted upwards to represent the more costly set of strategies and better outcomes made possible with additional investment.

Figure 5 shows how the performance level concept is used to construct and describe alternative investment scenarios. Developed through the MnSHIP planning process, these fiscally constrained investment scenarios reflect spending priorities and performance outcomes associated with one or more broad objectives, such as maintaining existing infrastructure or improving mobility and advancing local priorities. While total investment is held constant, the level of investment in a specific investment category (represented by the performance level) varies depending on the extent to which the category contributes to a scenario’s objective. *The three scenarios displayed in Figure 5 and discussed below were developed for planning purposes only. In its adopted form, MnSHIP will articulate spending priorities and performance outcomes that reflect a blend of these three options.*

Figure 5. MnSHIP investment scenarios (total capital investment over the 2014-2033 planning period, excluding the STIP)



As Figure 5 demonstrates, investment in pavement condition is sufficient to achieve a performance level of “2” under a scenario in which MnDOT pursues the objective of maintaining existing infrastructure (Approach A). At this performance level, MnDOT would expect just 2% of the state’s Interstates to be in Poor condition in the year 2033. However, even with nearly half of MnDOT’s anticipated available revenue allocated to pavement condition, the percentage of the state’s non-Interstate principal arterials (PA) and non-principal arterials (NPA) in Poor condition in 2033 is expected to be 11% and 17%, respectively. This represents a significant decline from current condition in Minnesota, where 4.3% of PAs and 7.5% of NPAs were in Poor condition in 2012. Under a scenario in which MnDOT pursues the objectives of improving mobility and advancing local priorities (Approach C), investment in pavement is

sufficient to achieve only the minimum performance level of 0. At this performance level, Interstate condition is maintained at 2012 levels, but 20% of the state's non-Interstate PAs and 56% of its NPAs is expected to be in Poor condition by the end of the planning period.

Figure 5 omits information about the other nine investment categories for the sake of simplicity, but as with Pavement Condition, most of the other categories achieve higher performance levels in one scenario than in the others. In many cases, performance in these categories moves in the opposite direction of performance in Pavement Condition. For example, the investment category "Regional & Community Improvement Priorities" (represented by the pink slice) achieves a performance level of 0 under Approach A and a performance level of 3 under Approach C.

The development of alternative investment scenarios based on a range of possible performance levels has enabled MnDOT to facilitate a robust and informed discussion of anticipated performance in investment areas where aspirational targets are increasingly unachievable. This discussion has encouraged stakeholders to distinguish between outcomes that are sub-optimal but acceptable and those that pose a severe risk to critical objectives. In the context of a fiscally constrained plan, the development of performance levels has also helped to clarify the performance trade-offs that occur when investment is shifted from one category to another.

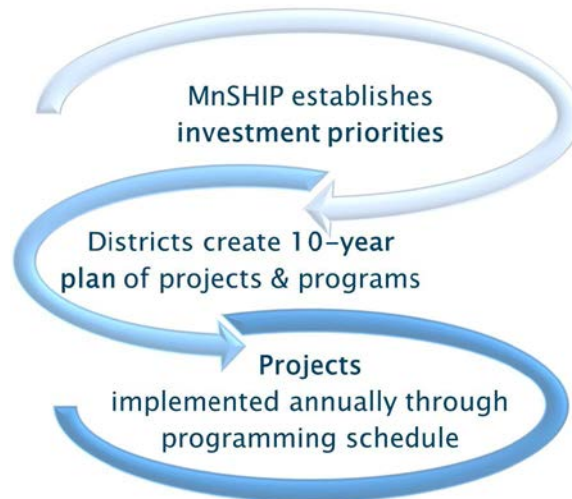
MnDOT uses the external and internal input obtained through discussions of MnSHIP investment scenarios to arrive at a combination of 10- and 20-year performance outcomes that reflect public priorities and manage key risks as effectively as possible. These outcomes constitute MnDOT's investment priorities and serve as the basis for resource allocation decisions.

Improving the linkage between planning, programming and project selection

Once MnSHIP has established a set of anticipated performance outcomes and category-specific spending levels, the next step is to plan improvements that will make these outcomes a reality. Figure 6 illustrates the role of performance in this process. Every year, MnDOT's eight districts develop draft 10-year plans of projects and programs using MnSHIP investment priorities and associated strategies as a guide. These draft plans are then evaluated using the same performance measures, targets, and predictive models that inform the establishment of statewide performance outcomes through MnSHIP. The purpose of this evaluation is to determine whether the projects and planned investments contained in the districts' 10-year plans will result in the same or similar results that were anticipated when MnDOT set its investment priorities. Draft 10-year plans that result in outcomes significantly above or below

what is anticipated in MnSHIP are subject to additional scrutiny and review by senior leadership.

Figure 6. MnDOT's Annual Performance Management Cycle



An example of how anticipated performance outcomes are being used to guide MnDOT investment decisions is the Statewide Performance Program (SPP), which has been developed through MnSHIP in response to MAP-21 performance requirements. In its current form, MnSHIP allocates approximately 45% of total available revenue to the SPP (the remaining 55% is allocated to MnDOT districts for the purpose of managing key risks identified at the regional-level). Most of the investment allocated to the SPP is associated with 10-year statewide performance objectives that anticipate MAP-21 targets for Interstate pavement condition, non-Interstate NHS pavement condition, bridge condition, and congestion reduction. MnDOT's pavement and bridge specialty offices, in collaboration with MnDOT districts, used current condition information, deterioration curves, and predictive performance models to identify a list of improvements that will enable MnDOT to achieve these statewide objectives within the constraints of SPP funding.

At the project level, MnDOT uses performance measures, performance-driven investment strategies, and ongoing performance monitoring to identify eligible uses for resources that have been allocated to particular investment categories. As an example, MnDOT limits eligibility for investment out of the pavement and bridge investment categories to assets that have fallen below a specified condition threshold. In the case of the Traveler Safety investment category, MnDOT uses historical crash rate data relative to the statewide average to determine which intersections are eligible for moderate-to-high cost safety improvements.

Target setting: aspirational vs. risk-based targets

Historically, MnDOT has set aspirational targets designed to achieve optimal or desired performance levels in particular investment categories. These targets have typically been based on lowest life-cycle costs and/or customer expectations. Others have been trend-based – set by looking at trends and outcomes associated with historical spending levels. While MnDOT continues to use some of these targets to estimate its unconstrained investment needs, the current funding reality has made aspirational targets unachievable in most cases. As a result, MnDOT has moved toward a risk-based approach to target setting. Unlike many aspirational performance targets, MnDOT's risk-based performance targets are:

- **Strategic:** Risk-based targets do not necessarily reflect optimal outcomes within a particular investment area. Rather, risk-based targets represent strategic objectives within a plan to manage agency risks.
- **Realistic:** Risk-based targets are meaningful in that they can be realistically achieved under existing revenue expectations. Unlike aspirational targets, risk-based targets can be managed to.
- **Adjustable:** Risk-based targets are derived from risk assessments and revenue expectations at a point in time. These targets are continuously reevaluated as risks and revenue expectations evolve.

MnDOT's first experience with risk-based target setting occurred as a result of an agency risk assessment conducted in 2011. This risk assessment identified deteriorating pavement condition as the most serious problem facing the agency. It also established a range of condition levels at which MnDOT was willing to accept the risks associated with poor pavement. At the time, the percentage of the state highway system with Poor pavement condition exceeded statewide targets for principal arterials (actual: 3.7%; target 2.0%) and non-principal arterials (actual 6.8%; target 3.0%). Based on the range of acceptable condition levels identified through the risk assessment, MnDOT made a commitment to maintain the percentage of the entire system with Poor pavement condition between 5 and 9%.

Although the percentage of pavement in Poor condition in 2011 was only slightly over 5%, MnDOT's predictive performance models indicated that maintaining system condition within the 5-9% range would require significantly more pavement investment than was planned under existing policies. In response, MnDOT developed the Better Roads for a Better Minnesota program that allocated an additional \$400 million between 2012 and 2015 to improve 750 miles of pavement in Poor condition. Unlike MnDOT's base pavement program which is programmed at the district level in consultation with MnDOT's local partners, Better Roads was centrally programmed using innovative engineering and delivery techniques that maximized its

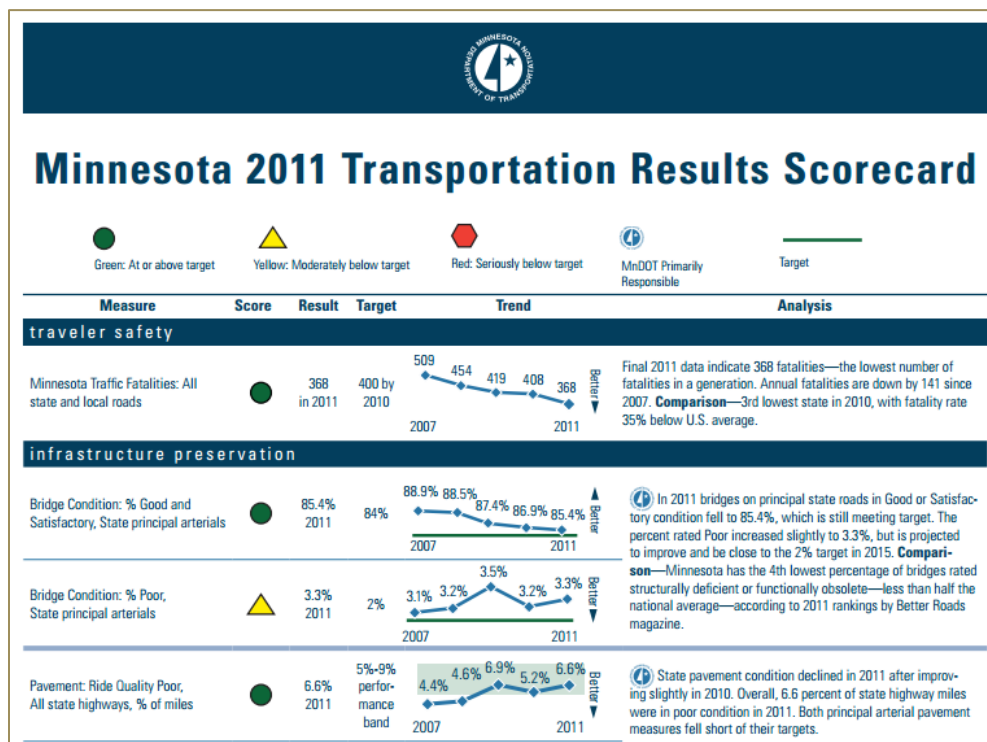
cost-effectiveness in terms of system performance. The successful implementation of Better Roads is expected to keep the percentage of the system in Poor condition within the 5-9% band throughout the 2013-2016 STIP.

Evaluation and Review

MnDOT has institutionalized several tools to ensure that the highway planning and programming process remains consistent with department goals and policies. The most important tool is the periodic review of system performance by senior leadership. This review results in frequent adjustments to MnDOT’s 10-year capital program.

Another important tool is the publication of the Annual Minnesota Transportation Performance Report, which compares historic and anticipated performance to targets using a combination of symbols, colors, and contextual analysis (Figure 7). This report provides an opportunity to publically evaluate MnDOT’s progress toward Statewide Multimodal Transportation Plan objectives. It also has proven to be an effective forum for describing the challenges facing the state transportation system and the rationale behind MnDOT’s decision-making. Information in the performance report is frequently used to demonstrate the impact of specific funding requests in MnDOT’s biennial budget request to the Minnesota State Legislature.

Figure 7. Annual Minnesota Transportation Performance Report



Southeast Michigan Council of Governments

The Southeast Michigan Council of Governments (SEMCOG) is the MPO for the Detroit, Michigan urbanized area. When adopting the 2035 regional transportation plan, SEMCOG’s elected officials approved a regional investment strategy with performance measures, targets and funding for achieving the targets.

Developing goals, objectives, and performance measures for SEMCOG was a collaborative effort with stakeholders. At a work session in March 2011, stakeholders were organized into 14 different breakout groups to brainstorm ideas. SEMCOG compiled and synthesized the suggestions from each breakout group to identify its six regional outcomes:

- Economic prosperity
- Desirable communities
- Fiscally sustainable public services
- Reliable, quality infrastructure
- Healthy, attractive environmental assets
- Access to services, jobs, markets and amenities

Performance measures were developed under each desired outcome. For example, under the “Reliable, quality infrastructure” outcome, performance measures included measures on pavement condition, failure rates, and service reliability. In the summer of 2011, SEMCOG published its final outcomes and performance measures (Goals and Objectives) and began to connect these with analysis of project needs. Figure 8 shows the primary performance measure for SEMCOG’s program areas.

Figure 8. Sample of SEMCOG Performance Measures

Program Area	Performance Measure
Pavement Preservation	Percent of pavement in good or fair condition
Highway Capacity	Hours of delay per 1,000 vehicle miles
Bridge Preservation	Percent of bridges in good or fair condition
Safety	Fatalities per 100 million vehicle miles
Transit	Extent of transit network
Nonmotorized	Population % within 1/2 mile of a facility
Roadway Operations	<i>Not currently addressed</i>

As part of its regional transportation planning efforts, SEMCOG has focused on providing information to decision makers to help them understand the consequences of different levels of investment. Actual project selection takes place at a later step, or during programming.

SEMCOG's process focuses on making informed trade-offs between key program areas. The process begins by identifying key performance goals areas and developing metrics for each. Then, a variety of investment scenarios are developed. Then, the relationship between each investment scenario and future expected performance is analyzed. Performance of scenarios is compared and presented to decision makers. SEMCOG staff then work with decision makers to select a preferred alternative (or modify scenarios and begin the process anew).

SEMCOG potential funding scenarios organized around several key themes. These include:

- **Current Allocation** – Distributed funding to programs consistent with the way they were allocated previously;
- **Public Opinion** – Used information from public involvement sessions conducted as part of the regional plan update to distribute more funding to programs identified as preferred by the public;
- **Preservation First** – Distributed funding to maximize pavement and bridge performance, then distributed the remaining funds to other programs;
- **Transit First** – Distributed funding to maximize transit performance, then distributed the remaining funds to other program areas; and
- **Maximum Performance**- This scenario attempts to balance funding to achieve relatively equal performance returns across program areas.

Figure 9 summarizes the scenarios used, including both the distribution of funding and expected future performance for each program area. These scenarios were presented to decision makers, who used this information to identify preferred funding levels for each program.

Figure 9. SEMCOG Scenario Analysis

Program Area 2010 Performance		1. Current Allocation		2. Public Opinion		3. Preservation First		4. Transit First		5. Maximum Performance	
		2030 Target	Funding Split	2030 Target	Funding Split	2030 Target	Funding Split	2030 Target	Funding Split	2030 Target	Funding Split
Transit	Current system	Current System	21%	< Current System	12%	< Current System	21%	Transit Vision	41%	Transit Vision	22%
Pavement	57 % pavement in good or fair condition	57%	21%	49%	18%	85%	31%	40%	14%	97%	21%
Bridge	85 % bridges in good or fair condition	100%	6%	100%	7%	85%	3%	80%	3%	99%	3%
Expansion	2.9 hours of congestion delay per 1,000 vehicle miles traveled	2.6	10%	2.6	10%	3.0	2%	3.0	0.0%	2.3	10%
Safety	0.77 fatalities per 100 million vehicle miles traveled	0.74	0.5%	NA	7%	0.73	0.8%	0.73	0.8%	0.72	2.0%
Nonmotorized	13 % population and employment within ½-mile of nonmotorized facility	44%	0.5%	100%	5%	44%	0.5%	13%	0.0%	100%	2.0%
Roadway Operations	NA		41%		41%		41%		41%		41%

SEMCOG leadership chose a modified scenario that emphasized maintenance and preservation. SEMCOG produces an annual list of deficiencies (e.g. pavement condition, safety, bridge condition, etc.), which are shared with member local government transportation departments. One purpose of these reports is to equip local governments with information so that they can apply for discretionary funding from state and federal sources (e.g., bridge funds, congestion mitigation air quality funds, safety/high risk rural road funds, etc.). Several tools were used for this analysis, including SEMCOG's travel demand model and national tools such as the Highway Economic Requirements System-State Version (HERS-ST) and the National Bridge Investment Analysis System (NBIAS).

Figure 10 shows the final funding splits and expected performance returns on the system in the SEMCOG region. The table compares the 2030 plan to the 2035 update, and projects performance returns for the 2035 plan. Note the relatively large funding split dedicated to transit and pavement, which are expected to return improved performance. However, these gains will be achieved by making tradeoffs. Program areas like operations and safety are expected to perform at about the same levels. Areas like highway capacity and bridge are expected to decline.

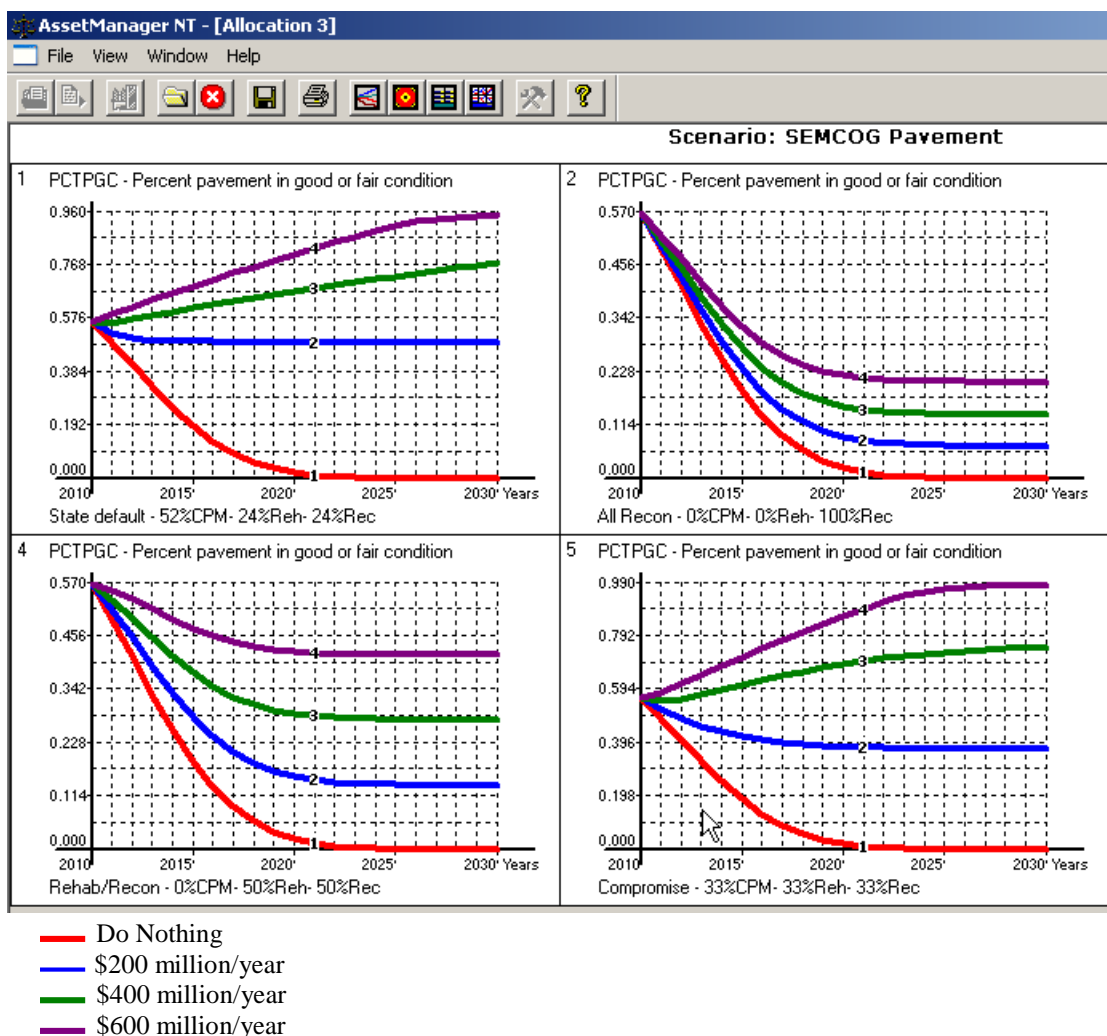
Figure 10. Funding Scenarios and Change in Performance

Program Area	Current RTP Allocation		Final Committee Allocation		Change in Performance (Committee to Current Allocations)
	Funding Split	2035 Performance	Funding Split	2035 Performance	
Transit	21%	Current System	23%	Current System + 3 Rapid Transit Lines	↑
Pavement	21%	57% in good or fair condition	24%	69%	↑
Bridge	6%	100% in good or fair condition	4%	91%	↓
Highway Capacity	10%	2.6 hours of delay per 1,000 VMT	8%	2.8	↓
Safety	0.5%	0.74 fatalities per 100 million VMT	0.6%	0.74	↔
Nonmotorized	0.5%	44% of people and jobs within ½ mile	0.9%	58%	↑
Road Operations	41%	N/A	40%	N/A	↔

A key step in SEMCOG's approach is to then examine the relationship between investment levels and future performance. Figure 11 presents a set of graphs used by SEMCOG to describe

the relationship between investment and performance of pavement condition. The purpose of the graph is to show the percentage of roadway segments that will have pavement in good or fair condition over the time horizon of the plan. Four scenarios are presented, with each scenario having different splits for capital preventative maintenance (CPM), rehabilitation, and reconstruction. The color of the line corresponds to a dollar figure of available funding. Using this information, SEMCOG can see that a blend of all three maintenance strategies yield the best returns. Also, higher levels of investment provide a better outcome. These graphs were generated by AssetManager NT, which is available through the American Association of State Highway and Transportation Official's AASHTOWare program.

Figure 11. SEMCOG Investment Analysis



SEMCOG develops an annual monitoring report of plan outcomes. Dubbed *Creating Success*, the report monitors and evaluates project implementation. SEMCOG is in the midst of developing a dashboard for our website but even now you can view on our website numerous

performance measures that we track (see SEMCOG Community Profiles at <http://www.semco.org/>).

To link their planning and programming efforts, SEMCOG evaluates funding by category between the LRTP and TIP. This allows the agency to compare investment level targets identified in the long range plan with the splits in funding for projects that are actually built. Figure 12 presents the tracking of investment levels through actual construction. This information is updated along with the TIP and is posted on the SEMCOG website (http://www.semco.org/TIP_Consistency_Direction2035.aspx).

Figure 12. SEMCOG Transportation Improvement Program Investment Levels

Project Type	Estimated Funding (in millions)	Share of Funding TIP	Share of Funding Direction2035
Pavement	\$520.9	14.5%	24%
Bridge	\$203.5	5.2%	5%
Road Expansion	\$138.1	3.5%	8%
Safety	\$25.4	0.6%	1%
Transit Capital	\$276.3	7.0%	8%
Nonmotorized Facilities	\$41.6	1.1%	1%
Operating	\$2,685.0	68.1%	53%
Total	\$3,940.8	100.0%	100.0%

Source: Southeast Michigan Council of Governments

Champaign Urbana Urbanized Area Transportation Study

The Champaign-Urbana Urbanized Area Transportation Study (CUUATS) is the MPO for the Champaign-Urbana, Illinois area and is part of the Champaign County Regional Planning Council. Over the past decade, CUUATS has adopted an increasing number of performance-based elements in its long-range plan and frequently updates information in a robust performance tracking and reporting system to measure its progress toward system-wide goals and objectives.

Background

CUUATS began to consider incorporating performance elements into its long range planning and more regularly tracking and reporting on performance during the development of its 2025 long range plan, which was adopted in 2004. Around that time, the MPO developed its first in-house travel demand model, which for the first time allowed CUUATS to quantify the impacts of its policies, such as VMT and congestion. New modeling capabilities in particular spurred the conversation among the MPO's staff about adopting more specific goals and objectives that could be associated with metrics. In 2009, the MPO adopted a 2035 transportation plan that got much closer to the desired level of detail and allowed CUUATS to set targets in a consensus-based process. Through effective communication with representatives of the MPO member agencies regarding and model's capabilities and limitations and with the financial support of IDOT, the MPO has been able to obtain funding to update the travel demand model and develop land use change, mobile source emissions, social cost of development and local affordability, and livability index models that allow development and tracking of new area-specific performance measures and facilitate better informed transportation planning.

Developing Goals, Objectives, and Performance Measures

Goals and objectives were developed by CUUATS staff and approved by the LRTP steering committee, based on public input, local knowledge, and best planning practices. During each LRTP update, goals and objectives are revisited. The current 2035 LRTP, completed in 2009, contains 12 goals, which are group according to the eight SAFETEA-LU planning factors.

Each goal contains objectives, and each objective has one or more associated "measures of effectiveness" (MOEs) that allow CUUATS to measure whether the objective has been met; these objectives meet FHWA's criteria to be considered SMART objectives (Specific, Measurable, Agreed, Realistic and Time-bound). CUUATS staff state that SMART MOEs help facilitate the creation of measures during the planning process because they provide an easily understandable guide on which member agencies and the public can agree. MOEs, both output- and outcome-based, are defined in the three areas covered by the plan: land use,

environment, and transportation. Within transportation, measures are divided by mode. Some measures of effectiveness established in the 2009 LRTP had no previous data collection associated with them and thus were rated neutrally until trends could be established through regular data collection. Data for the MOE evaluation often comes from readily available sources and generally does not require complex calculations, but some data comes from CUUATS' models or through GIS analysis. The data is made readily understandable to facilitate the process of tracking performance by CUUATS, its member agencies, and the public.

Setting Targets

Once goals, objectives, and performance measures are identified and agreed upon, CUUATS sets targets for 5- or 10-year levels based on the MOE and type of objective. In order to set targets for the 2035 LRTP, the MPO's staff held a series of meetings with stakeholders to discuss each performance measure, the level of performance that could be expected based on funding levels and the specific projects that were expected to be delivered within the next 3-5 years. Discussions continued until a general consensus was reached on an appropriate target for each measure. In some cases, the MPO set realistic targets, while others were more aspirational, especially those for which data was less precise or available.

Linking Planning to Project Selection Decisions

CUUATS has worked over the past ten years to identify and implement ways to better link its planning and performance tracking efforts to the selection projects. In previous cycles, the MPO identified the goals and objectives that would be furthered by projects already in its TIP. In recent years, CUUATS has created a Project Priority Review Guidelines document based on the goals and objectives set for in its LRTP and the eight SAFETEA-LU planning factors. It plans to use these guidelines to identify and evaluate projects for receiving priority for federal funding in the future.

Monitoring, Evaluating, and Reporting on Performance

CUUATS publishes an annual "Report Card" that provides a summary of progress toward each target and background information that helps to provide context to performance results (see Figures 13-15 below for examples of the type of information in the Report Card). The document strikes a careful balance between being data-driven while also being user-friendly and not overwhelming the reader. The MPO has found that the Report Card has been a useful tool in communicating with the public, especially during public meetings related to the LRTP update process. By demonstrating the link between the public input it received in previous LRTP planning cycles and subsequent results, CUUATS has heightened attendance and participation at these meetings. In recent years, CUUATS has also used performance information to involve

the bicycle community and demand response service providers, who now serve on the LRTP steering committee. In addition to heightening interest and participation in its long-range planning efforts, CUUATS has found that enhancing its modeling, usage of data, and performance reporting has improved its credibility among the community's highly technically-savvy university population. Whereas some community members and stakeholders had previously been critical of the MPO's data methods and sources, CUUATS now has a cooperative relationship with the university departments and professors that involves exchange of data and information that is factored into the MPO planning process. The MPO's member organizations (local governments) have also been able to use the Report Card to approach board members in their respective jurisdictions to demonstrate what was accomplished based on funding the jurisdictions invested in previous cycles. Demonstrating the funding-performance link has been useful for communicating needs and impacts, providing greater incentives for local governments to invest in transportation projects that address issues the public cares about.

Data considerations

CUUATS staff emphasize that there is a need to have easily accessible, long-term, and consistent data sets over time to help track performance in the region. Once the MOEs are established, coordination with the member agencies and the use of CUUATS' models are vital to the update of the LRTP Report Card each year. U.S. Census and American Community Service data is essential for establishing baseline data and data updates for a metropolitan region like Champaign-Urbana, which has a population of less than 200,000.

Figure 13. Example of Reporting on Performance for a Specific Measure of Effectiveness, Improved Roadways



This MOE receives a positive rating because more than 50% of the roadways improved were within the municipal boundaries of a jurisdiction.

Table 6.4 Improved Roadways MOE Summary

Goal	12. To the greatest extent possible, improvements will be made to the existing roadway network to preserve or improve upon its current condition and to add pedestrian, bicycle and transit facilities where needed
Objective	Ensure that no more than 50% of all roadway improvements or construction projects, between 2009 and 2014, fall outside the 2009 municipal boundaries of Champaign, Urbana, Savoy, and Bondville.
MOE	Miles of New Roadway Constructed or Improved Inside Municipal Boundaries
Status	More than 50% of the roadways improved were within municipal boundaries - Positive Rating

Figure 14. Summaries on CUUATS’s Performance on 16 Measure of Effectiveness

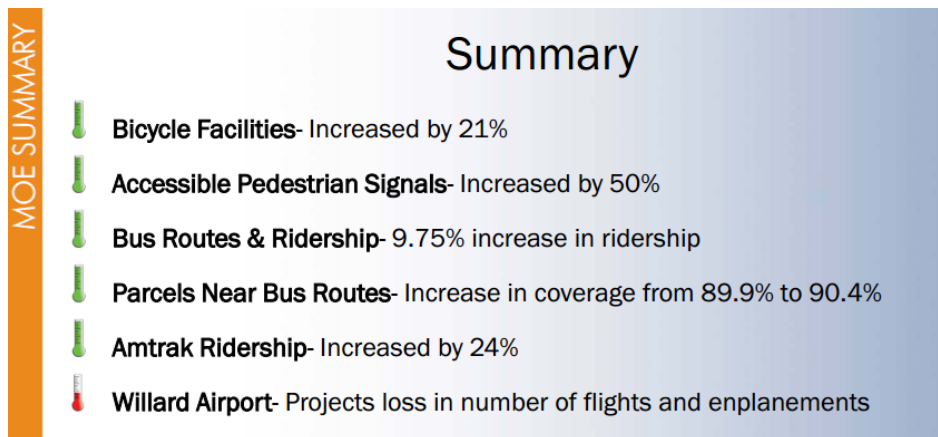
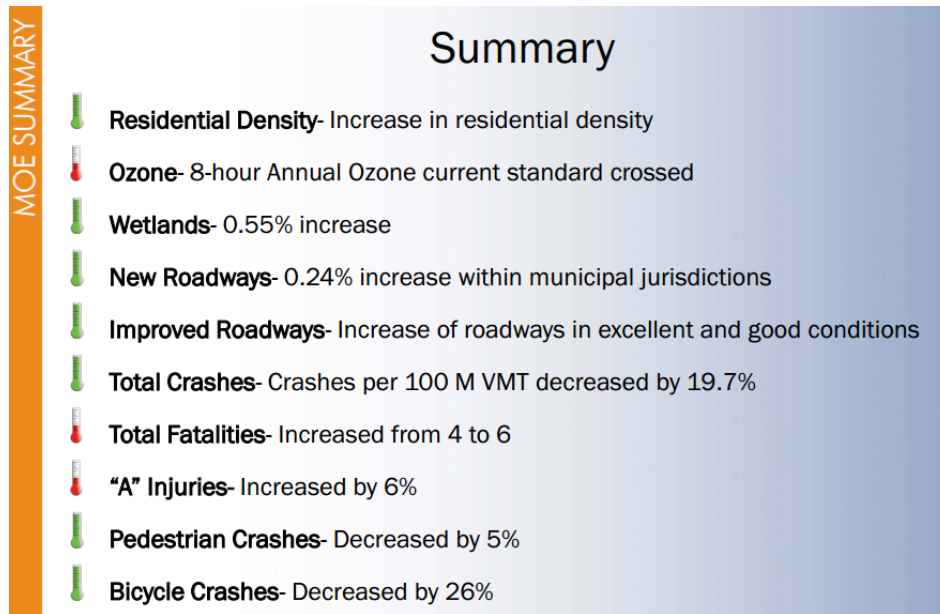


Figure 15. Summaries on CUUATS’s Performance on 16 Measure of Effectiveness (continued)

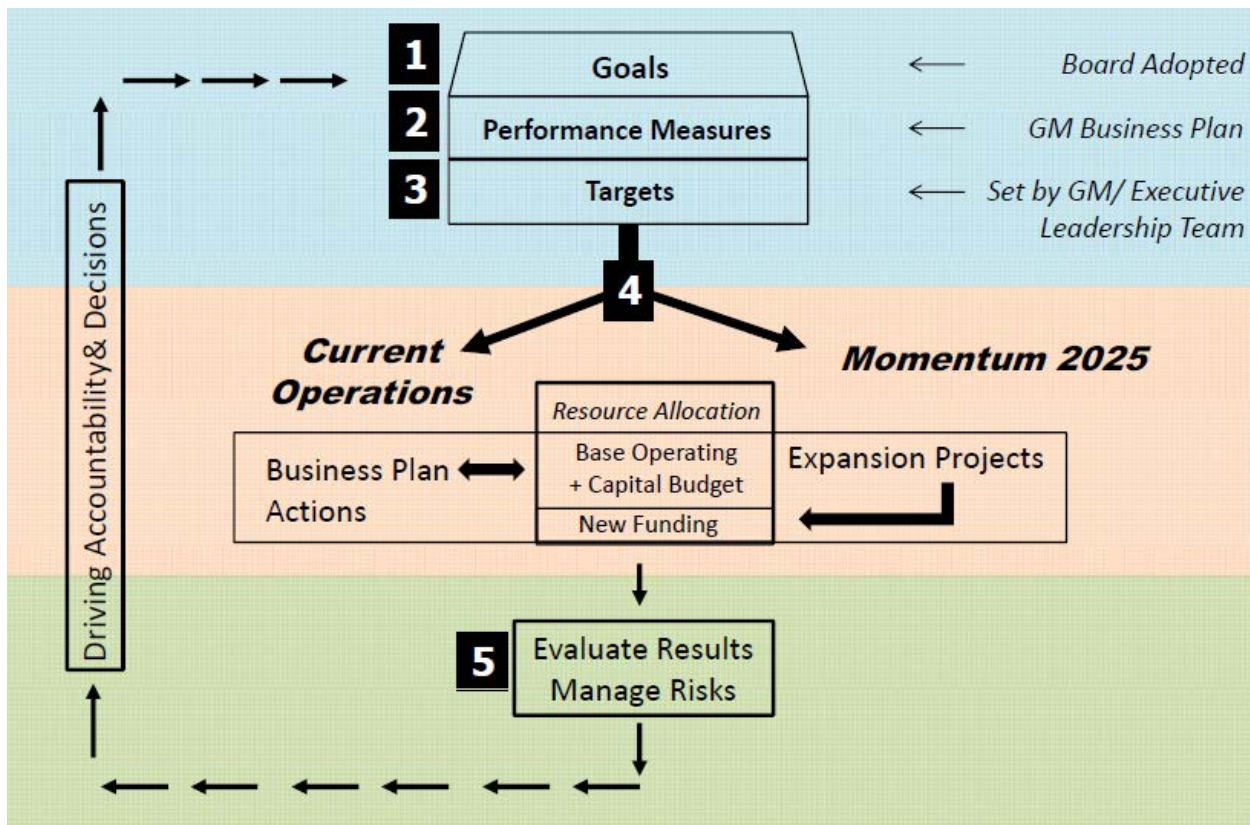


For more information about CUUATS’s performance-based planning efforts, see <http://www.ccrpc.org/transportation/>. For more information on the CUUATS Modeling Analysis Package, see <http://cuuats.org/models>.

Washington Metropolitan Area Transit Authority

The Washington Metropolitan Area Transit Authority (WMATA), the public transit provider of bus, rail and paratransit services in the Washington, DC region, has established many of the performance-based planning and programming elements necessary to become a more strategic, accountable and transparent organization (see Figure 16).

Figure 16. WMATA’s Performance-Based Planning and Programming Approach

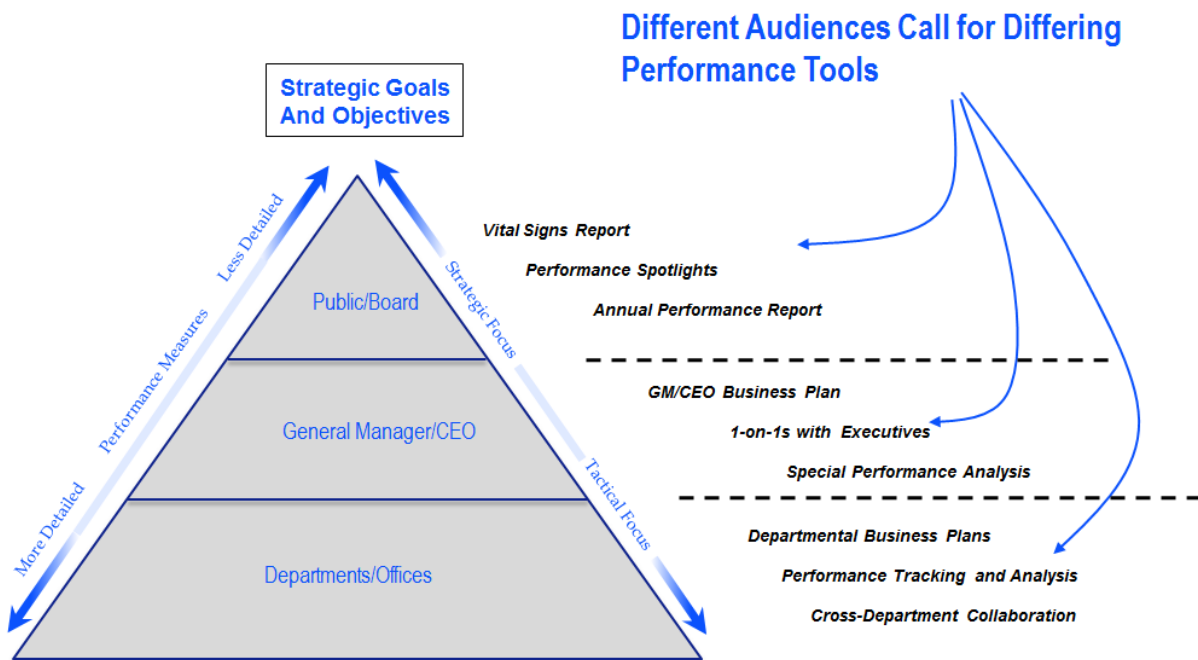


By establishing a framework for setting goals, developing measures, determining targets, allocating resources and evaluating results, WMATA has delivered better, safer, more reliable service to customers. Comparing 2012 results to 2011, WMATA’s performance improved in 10 of the 12 measures tracked in its monthly monitoring report. Keeping safety the agency’s top priority led to improvements in both customer and employee injury rates. Both rail and bus on-time performance improved due to schedule adjustments to reflect actual travel times, real time monitoring and a more reliable fleet. Railcar reliability experienced a particularly notable improvement in the final months of 2012 after the root cause of door system failures was solved, resulting in 70% more miles delivered before a delay incident.

Escalators, one of WMATA’s highest profile assets, demonstrated that better maintenance pays off. WMATA hired 18 more mechanics in 2012, focused resources on stations with the lowest availability, and replaced units at two key stations to drive down average time to repair. The positive impact of a performance focus was also demonstrated by an increase in the customer commendation rate.

A key to WMATA’s progress in becoming a performance-based organization was the establishment of a standalone Office of Performance in 2010. This office is dedicated to expanding the use of performance information to guide decisions, to promote WMATA's benefits in the region and to unify employees to accomplish agency goals. Since its inception, the Office has developed a range of performance tools that connect day-to-day work of WMATA's employees to agency goals. As illustrated in Figure 17, the types of performance tools vary by level of specificity, by audience and by usage. The Office of Performance has been the main driver of WMATA’s adoption of performance-based planning and programming.

Figure 17. WMATA’s Performance Tools



Source: Performance-Based Planning and Programming: A Transit Perspective, presentation by Patricia Hendren, September 2011.

Setting Strategic Goals

In its most recent long range plan, Momentum: The Next Generation of Metro, the Board of Directors drove the development of WMATA's mission, vision and goals for building a transit system that supports a competitive region. The strategic plan presented in Momentum reflects thorough technical analyses, extensive outreach and feedback from regional stakeholders. Reflecting WMATA's broad reach across the region, the outreach plan was extensive and sought input from WMATA's customers, the general public, jurisdictional and federal funders, key regional civic organizations, WMATA's own employees, and stakeholders. Business and advocacy groups further extended the initiative's reach. WMATA's partners simultaneously joined the effort to promote maximum exposure, regional reach, and breadth of input. Through this process, WMATA identified four strategic goals:

1. Build and Maintain a Premier Safety Culture and System
2. Meet or Exceed Expectations by Consistently Delivering Quality Service
3. Improve Regional Mobility and Connect Communities
4. Ensure Financial Stability and Invest in our People and Assets

These four strategic goals define where WMATA wants to go and provides guidance for decisions across the agency. The "WMATA 2025" component of Momentum identifies seven pivotal investments in the capacity of the rail and bus systems to keep up with today's demands and continue to support the region's economic competitiveness and quality of life. Investments include running eight-car trains versus six-car trains during peak periods, core station capacity expansion, and improvements on 24 bus priority corridor networks which serve half of Metrobus ridership.

Developing Performance Measures

For each goal, the Office of Performance has worked with Departments across the agency to develop measures that demonstrate departmental contribution to these goals. In selecting performance measures, the Office considered the following criteria:


- Is there a clear link to the agency's goals?
- Is data available, consistently collected, and validated?
- Is the measure intuitive and easy to understand?
- Does WMATA have influence over the outcome?
- Is the total number of measures manageable?
- Will it change over time?

- Is the direction of improvement clear?
- Is the measure relevant to the audience?
- Is the measure commonly used in the industry?

In addition, Office of Performance worked with the General Manager/Chief Executive (GM/CEO) Officer and Executive Leadership to select a small set of key performance indicators to which the Board of Directors holds the GM/CEO accountable (See Figure 18). Measures developed for Departments, Offices and the GM/CEO are annually evaluated to assess how well they are meeting the criteria listed above and when new data becomes available, new measures are considered.

Figure 18. CY2013 – 2015 GM/CEO Business Plan Measures

Strategic Goal	GM/CEO Performance Measure
Safety	<ul style="list-style-type: none"> • Employee Injury Rate • Customer Injury Rate • Crime Rate
Quality Service	<ul style="list-style-type: none"> • Bus On-Time Performance • Rail On-Time Performance • Access On-Time Performance • Escalator Availability • Customer Commendation Rate • Customer Complaint Rate
Invest in People & Assets	<ul style="list-style-type: none"> • Operating Expenses on Budget • Capital Funds Expended • Number of Positions Filled
Connect Communities	• TBD



Determining Targets

On an annual basis, the Office of Performance facilitates a half day session with the GM/CEO and the Executive Leadership Team to determine targets for the key performance indicators. The executives review historical data trends, activities planned for the coming year, resource constraints, externalities that may impact results (e.g. major construction projects on bus routes) and performance results from peer agencies. Given that the audience for these targets is the Board of Directors and the public, WMATA strives for targets that push progress, but are realistic to attain. The table below demonstrates how the CY2013 escalator availability target was set. WMATA first calculated that the impact of planned replacement, rehabilitation and other scheduled work (e.g., jurisdictional inspections) would bring system availability down to 94.6%. If WMATA applied the average level of unscheduled maintenance

over the past two years (8.25%), this would suggest a CY2013 target of 86.4%. Given recent maintenance improvements, the assumption was made that unscheduled work would continue to decline. In addition, lowering the escalator target from 89% to 86.4% did not seem feasible in the existing stakeholder climate so, the target was kept at 89%.

For Departments and Offices, targets are typically evaluated on an annual basis with assistance by the Office of Performance when requested.

Table 2. Historical Escalator Availability

	CY11 Data	CY12 Data	CY13 Estimate
Max Escalator Availability	100%	100%	100%
<i>Less Availability due to:</i>			
Scheduled replacements and rehabilitation	2.7%	3.2%	4.4%
Other scheduled maintenance	1.8%	1.0%	1.0%
Unscheduled maintenance	10.0%	6.5%	5.6%
Average Availability	85.5%	89.3%	89%
TARGET	89%	89%	89%

Resource Allocation

To guide the allocation of resources, WMATA uses business plans to link employees’ day-to-day activities to agency goals. The business plans contain actions planned under a constrained budget that are necessary to make progress towards agency goals. In addition, specific measures and targets are set in each plan to evaluate and define success. An action owner is listed to clarify who is responsible for each action’s execution and cross-agency dependencies are mapped out (see Figure 19). Combined, these business plan elements provide:

- Key information for the decision-making process by clearly articulating agency goals, performance outcomes, and actions necessary for success;
- Linkage between employee day-to-day work and the goals contained in Momentum;
- Prioritization framework to guide resource allocation;

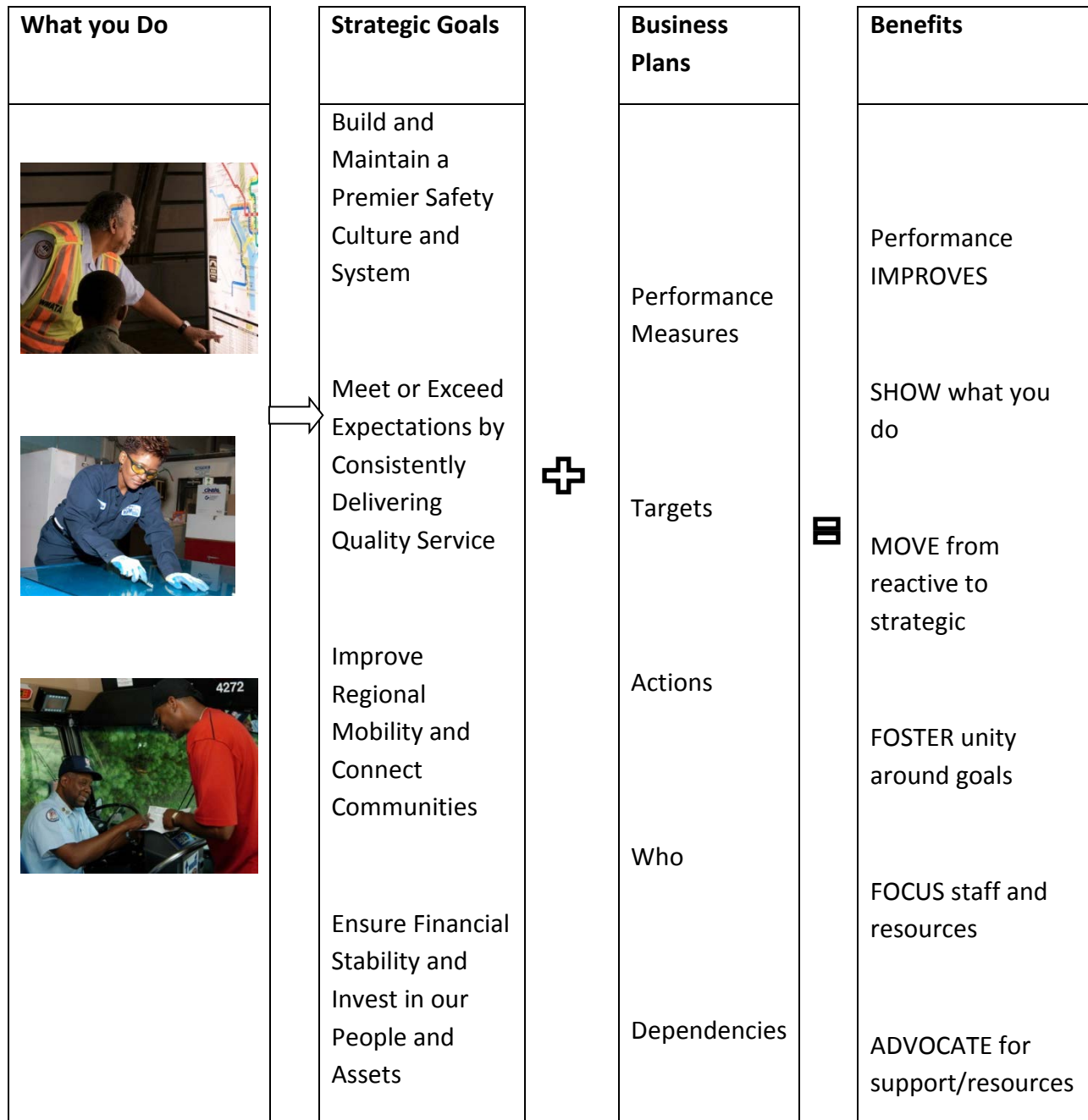
- Rationale for resources needed to improve performance; and
- A baseline against which future performance and investment discussions will be evaluated.

Over the years, WMATA has learned to keep these plans simple and to keep the focus on a small set of measures and actions. Business plans are intended to be the road map to improving performance.

WMATA has made several attempts to strengthen the linkage between budgetary decisions and agency goals. In 2009, WMATA used agency strategic goals to prioritize each capital project in the more than \$11 billion FY2011 – 2020 Capital Needs Inventory. This enabled WMATA to present to the Board of Directors which capital needs should be funded first and which would need to be deferred beyond FY2020 at different funding levels. Using prioritization results, WMATA staff could clearly communicate the impact of funding constraints to its Board. For example, if WMATA's funding continued at recent levels (about \$550 million per year) only 70% of WMATA's basic maintenance needs would be met and zero funding would be available to meet growing ridership or improve customers' experience. The funding agreement signed with the region in 2010 increased WMATA's annual capital budget to \$800 million per year.

During WMATA's annual budgetary process, departments requesting unfunded initiatives are required to link the initiative back to an agency goal and describe how progress will manifest through a particular performance measure. The difficulty in quantifying outcomes for the various initiatives and internal resistance to using data to drive funding decisions has hindered efforts to tightly link initiatives to agency goals. However, each year brings the budget and strategic goals closer together.

Figure 19. WMATA Business Plans Link Day-to-Day Activities to Goals



Evaluating Results

The public and Board of Directors receive frequent performance updates from WMATA through various means. The Office of Performance's Vital Signs Report covers a small number of key performance indicators (KPI's) to monitor long term progress in the strategic areas of safety, security, service reliability and customer satisfaction. A detailed performance analysis is presented in the Vital Signs Report through answers to two prime questions: Why did performance change? What actions are being taken to improve performance? WMATA is focused on these two questions to continually drive improvement. This report documents performance results and strives to hold WMATA's management accountable for what is working, what is not working, and why.

On its website, WMATA has published a "WMATA Scorecard," which provides information to the general public in a dashboard-style, user-friendly interface that allows users to click on icons for more detailed information about performance measures. The Office of Performance considers the Scorecard a supplemental tool and cautions that such simplified tools makes it difficult to convey the various factors that shift performance; thus, the agency hopes the Scorecard will pique readers' interest in the Vital Signs Report materials, which provide contextual information to better explain the results.

The Office of Performance also teams up with Departments to present "performance spotlights" at the request of the Board. Spotlights can take the form of Board presentations or memos and have addressed a wide range of issues including: escalator availability, bus and rail on-time performance, rail service standards, contractor vs. in-house maintenance results, effectiveness of customer satisfaction measures, use of "hot spot" data to reduce bus collisions, and impact of mid-day track maintenance on service delivery.

On an annual basis, the Board evaluates the GM/CEO based in part on progress made towards agency goals as documented by the results of the performance measures contained in the GM/CEO business plan. The GM/CEO in turn keeps the agency focused on the goals through monthly 1-on-1 meetings with each member of the Executive Leadership Team to discuss performance measure results and actions leading to results. The Vital Signs Report, Scorecard, performance spotlights and the GM/CEO annual evaluation demonstrate WMATA's commitment to being transparent and accountable to the Board of Directors, jurisdictional stakeholders and the public.

At WMATA, the consistent use of performance based management varies by Department, but the approach has been gaining acceptance as its value becomes more apparent. As an

example, the Bus Maintenance department has a long history with performance management, including established of measures that clearly tie back to WMATA's goals, regular review of results, and discussions of how organizational actions are impacting these results. Similarly, the Metro Transit Police Department (MTPD) has established METROStat, a process for systematically collecting crime data and analyzing incidents to identify and prioritize trends and/or hot spot locations. METROStat results, assessed bi-weekly, serve to increase accountability within the MTPD, foster better cooperation and coordination across and between departments, and modify crime reduction approaches.

More recent initiatives in the departmental implementation of performance management include the Bus Transportation department's Superintendent Meetings, which are patterned after the GM/CEO's "1-on-1s." This approach engages departmental management to regularly review safety and service delivery results and assess actions taken. An initiative with a broader reach includes the 2013 release of an organizational asset management policy. This policy requires the use of life-cycle data to guide maintenance activities across the organization, something new to WMATA.

Even with these notable examples of evaluating performance results, there still remains a gap between the existence of data and the use of data at WMATA. For example, WMATA yard and shop personnel had used an application to manage the movement of rail cars in the yards. Only recently was the device enhanced to enable system rail managers to monitor car availability allowing them to manage fleet deployment on a system-wide basis, in order to have cars strategically located for balanced operations and delay response. Although this was an example of a successful translation of data into information, there remain many more examples of untapped data.

In a mature performance-based approach, the direction set by the GM/CEO through the measures, targets and actions in his/her business plan would cascade down to the Department level business plans and individual performance plans. At WMATA however, creating a strong tie between individual performance plans and agency measures and even strategic goals remains a challenge. As a result the evaluation of individual performance is separated from efforts to achieve agency goals.

Impact of a Performance-Based Approach: Moving from Reactive to Strategic

WMATA's transition to a performance-based organization has enabled the agency to move away from being primarily reactive to being more strategic. Over the past few years, WMATA has regularly used performance data to inform operational decisions to advance its key goals,

and determining how to prioritize goals if and when they conflict. Below are a few examples of ways in which the agency has used performance measurement data to enhance its overall performance.

- By tracking data on reliability and track outages due to maintenance, WMATA was able to identify that mid-day track work in 2012 – a key strategy to achieve its goal of investing in assets – was having a significant impact on on-time service performance, which had been identified as a top concern of customers. As a result, WMATA expanded its “track work free time” to mid-day during the weekdays, and shifting some of the time it had spent on track work to weekend shut-downs and off-peak evenings. One year later, on-time performance during mid-day periods had improved considerably.
- WMATA regularly tracks its performance with respect to escalator availability. When the agency noticed that its performance in this area was poor, it examined a number of “sub-measures” including mean time to repair, mean times between failures or outages, and preventive maintenance compliance. The agency identified failure to comply with preventive maintenance schedules as a key cause of its poor performance in escalator availability. By shifting resources and staff time to enhancing preventive maintenance compliance, WMATA has been able to increase its compliance from 44% in 2010 to 89% in 2012, thus enhancing escalator availability.
- In addressing performance toward its key safety goals, WMATA evaluated data on customer injury rates and identified bus collisions as the second most frequent cause of customer injuries. In order to explore ways to improve safety, Bus Transportation identified “hot-spots” – sites where four or more collisions occurred on a corridor. The Hot Spot locations were provided to each Division Superintendent, bus operators, training instructors, and street service operations managers. This information was also distributed to the Safety Department. By conducting site-specific identification and implementation of improvements to decrease the likelihood of a collision, WMATA has demonstrated to service operators that their actions do impact the organization’s performance, and the agency has improved its safety performance significantly.

In the last few years WMATA has established many of the performance-based planning and programming elements necessary to become a more strategic, accountable and transparent organization. A key to this success has been commitment from the agency’s GM/CEO. Nevertheless, WMATA recognizes that more work remains (e.g., strengthening linkage between goals and budget, increasing use of data to drive decisions and tying individual performance evaluation to agency goals and key indicators). WMATA’s experience demonstrates that

becoming a performance-based organization does not happen overnight. Instead, positive performance results come from a steady, incremental approach to establishing the five key PBPP elements: goals, measures, targets, resource allocation and evaluation.

12. ADDITIONAL RESOURCES

Glossary

Below is a list of key words used in this Guidebook and in federal and state transportation planning:

3-C Process – Continuing, cooperative and comprehensive planning process.

A continuing, cooperative, and comprehensive (“3 C”) process to encourage and promote the development of a multimodal transportation system that ensures safe and efficient movement of people and goods while balancing environmental and community needs.

[FHWA, Transportation Planning Capacity Building Acronym List.
<http://www.planning.dot.gov/glossary.asp#acronyms.>]

Asset management – A strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well-defined objectives.

[<http://tam.transportation.org/Pages/default.aspx>]

Additional resources on Asset Management are available at the FHWA Asset Management website, <http://www.fhwa.dot.gov/asset/>, and in NCHRP Synthesis 439, “Use of Transportation Asset Management Principles in State Highway Agencies,” available at: http://www.pavementpreservation.org/wp-content/uploads/2013/04/nchrp_syn_439b1.pdf. AASHTO’s *Transportation Asset Management Guide: A Focus on Implementation* is another good source for information on asset management.

Congestion management – Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods.

[http://www.planning.dot.gov/focus_congestion.asp]

Congestion Management Process (CMP) – A congestion management process (CMP) is a systematic and regionally-accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs.

A systematic approach required in transportation management areas (TMAs) that provides for effective management and operation, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities eligible for funding under USC Titles 23 and 49, through the use of operational management strategies.

[23 CFR Section 450.104.]

[Congestion Management Process Guidebook.

http://www.fhwa.dot.gov/planning/congestion_management_process/cmp_guidebook
△]

Corridor – A broad geographical band that follows a general directional flow connecting major sources of trips that may contain a number of streets, highways and transit route alignments.

[FHWA Transportation Planning Capacity Building Glossary.

<http://www.planning.dot.gov/glossary.asp>]

Financially constrained or fiscal constraint – The metropolitan transportation plan, TIP, and STIP includes sufficient financial information for demonstrating that projects in the metropolitan transportation plan, TIP, and STIP can be implemented using committed, available, or reasonably available revenue sources, with reasonable assurance that the federally supported transportation system is being adequately operated and maintained.

For the TIP and the STIP, financial constraint/fiscal constraint applies to each program year. Additionally, projects in air quality nonattainment and maintenance areas can be included in the first two years of the TIP and STIP only if funds are “available” or “committed.”

[23 CFR Section 450.104.]

Goal – A broad statement that describes a desired end state.

Long-Range Transportation Plan (LRTP) – A document resulting from regional or statewide collaboration and consensus on a region or state’s transportation system, and serving as the defining vision for the region’s or state’s transportation systems and services.

[FHWA Transportation Planning Capacity Building Glossary.
[http://www.planning.dot.gov/glossary.asp.](http://www.planning.dot.gov/glossary.asp)]

Metropolitan planning area – The geographic area in which the metropolitan transportation planning process required by 23 USC Section 134 and Section 8 of the Federal Transit Act (49 USC app. 1607) must be carried out.

[FHWA Transportation Planning Capacity Building Glossary.
[http://www.planning.dot.gov/glossary.asp.](http://www.planning.dot.gov/glossary.asp)]

Metropolitan Planning Organization (MPO) – The policy board of an organization created and designated to carry out the metropolitan transportation planning process.

[23 CFR Section 450.104.]

Regional planning body, required in urbanized areas with a population over 50,000, and designated by local officials and the governor of the state. Responsible, in cooperation with the state and other transportation providers, for carrying out the metropolitan transportation planning requirements of Federal Highway and transit legislation. Formed in cooperation with the state, develops transportation plans and programs for the metropolitan area. For each urbanized area, a Metropolitan Planning Organization (MPO) must be designated by agreement between the governor and local units of government representing 75% of the affected population (in the metropolitan area), including the central city or cities as defined by the Bureau of Census, or in accordance with procedures established by applicable state or local law.

[23 USC Section 134(b)(1) and Federal Transit Act of 1991 Sec. 8(b)(1).]

Nonmetropolitan planning- Planning and project selection that is performed by State DOTs in areas that are not part of the metropolitan planning organization (not in an urban area). Some states delegate the role of nonmetropolitan planning to Regional Transportation Planning Organizations (RTPOs).

Objective – A specific, measurable statement related to the attainment of a goal.

[FHWA Transportation Planning Capacity Building Glossary.
[http://www.planning.dot.gov/glossary.asp.](http://www.planning.dot.gov/glossary.asp)]

Operations – All decision making and actions necessary for the proper functioning of a system, such as information gathering (from a variety of sources), synthesis and processing, and dissemination and distribution of the decisions and information to traffic control equipment,

other agencies and decision makers (including those associated with maintenance activities), and the public. (Also see Transportation Systems Management and Operations.)

[“Traffic Control Systems Operations, Installation, Management, and Maintenance”; Kraft, W. and Giblin, J; ITE; 2000 Note – Added the context of “decision making” and “decision makers.”]

Performance-based planning and programming – refers to the application of performance management within the planning and programming processes of transportation agencies to achieve desired performance outcomes for the multimodal transportation system. Attempts to ensure that transportation investment decisions are made – both in long-term planning and short-term programming of projects – based on their ability to meet established goals.

FHWA Performance Based Planning and Program web site:

http://www.fhwa.dot.gov/planning/performance_based_planning/

Performance management – A strategic approach that uses data and information to support decisions that help to achieve performance outcomes.

Performance measurement – A process of assessing progress toward achieving goals using data.

Performance measure – A metric used to assess progress toward meeting an objective; an indicator of transportation system outcomes.

Planning factors – A set of broad objectives defined in Federal legislation to be considered in both the metropolitan and statewide planning process.

Both SAFETEA-LU and its predecessors, TEA-21 and ISTEA, identify specific factors that must be considered in the planning process. TEA-21 consolidated what were previously 16 metropolitan and 23 statewide planning “factors” into seven broad “areas” to be considered in the planning process, both at the metropolitan and statewide level. SAFETEA-LU increased the number of planning factors to eight by creating separate planning factors for safety and security. SAFETEA-LU added language to emphasize the correspondence between transportation improvements and economic development and growth plans.

Program – A coordinated, inter-related set of strategies, procedures, and activities, all intended to meet the goals and objectives articulated in vision statements and policies.

Programming – Prioritizing proposed projects and matching those projects with available funds to accomplish agreed upon, stated needs.

[FHWA Transportation Planning Capacity Building Glossary.
[http://www.planning.dot.gov/glossary.asp.](http://www.planning.dot.gov/glossary.asp)]

Project – Well-defined, individual actions and activities that make up a program. The implementation of projects is how the program is realized.

[FHWA, “Freeway Management and Operations Handbook”, FHWA-OP-04-003, September 2003]

Project selection – The procedures followed by MPOs, States, and public transportation operators to advance projects from the first four years of an approved TIP and/or STIP to implementation, in accordance with agreed upon procedures.

[23 CFR Section 450.104.]

Regional Concept for Transportation Operations (RCTO)– A Regional Concept for Transportation Operations is derived through sustained collaboration among stakeholders. It contains the shared regional objective for transportation operations and what is needed to achieve that objective – specifically physical improvements, relationships and procedures, and resource arrangements.

[http://www.plan4operations.dot.gov/reg_concept.htm]

Regional Transportation Planning Organization (RTPO) – An agency charged by the state to perform planning and/or project selection in nonmetropolitan areas (area not in an MPO). The structure, capabilities, and governance of RTPOs varies. The term Regional Transportation Planning Organization was introduced in MAP-21. Many RTPOs are known as rural planning organizations (RPOs), or other terms assigned by the state.

Scenario planning – Analytical approach that provides a comprehensive framework for evaluating how various combinations of strategies, or scenarios, may affect system performance at the statewide or metropolitan level. The approach involves identifying various packages or strategies or scenarios against a baseline projection.

Stakeholder – Person or group affected by a transportation plan, program or project. Person or group believing that they are affected by a transportation plan, program or project. Residents of affected geographical areas.

[FHWA Transportation Planning Capacity Building Glossary.
[http://www.planning.dot.gov/glossary.asp.](http://www.planning.dot.gov/glossary.asp)]

State Transportation Improvement Program (STIP) – A statewide prioritized listing/program of transportation projects covering a period of four years.

Must be consistent with the long-range statewide transportation plan, MPO plans, and TIPs; required for projects to be eligible for funding under USC Title 23 and 49 USC Chapter 53.

[23 CFR Section 450.104.]

Strategic Highway Safety Plan (SHSP) – The SHSP is a data-driven, comprehensive, multidisciplinary plan integrating the “4E’s” of safety – engineering, education, enforcement, and emergency medical services or emergency response. It establishes Statewide goals, objectives, performance measures, and emphasis areas and is developed in consultation with Federal, State, local, and private sector safety stakeholders.

[FHWA, Strategic Highway Safety Plan Implementation Process Model - The Essential Eight - Fundamental Elements and Effective Steps for SHSP Implementation <http://safety.fhwa.dot.gov/hsip/shsp/fhwasa10024/fhwasa10024.pdf>.]

Target – A specific level of performance that is desired to be achieved within a certain timeframe.

Transportation Asset Management (TAM) – see Asset Management.

Transportation Asset Management Plan (TAMP) – A risk-based TAMP contains the following elements:

1. A summary listing of the pavement and bridge assets on the National Highway System in the State, including a description of the condition of those assets;
2. Asset management objectives and measures;
3. Performance gap identification;
4. Lifecycle cost and risk management analysis;
5. A financial plan; and
6. Investment strategies.

A State asset management plan shall include strategies leading to a program of projects that would make progress toward achievement of the State targets for asset conditions and performance of the National Highway System. Development of the TAMP should lead to the incorporation of asset management into the long range planning process and improve the coordination between the maintenance and capital programs.

[23 USC Section 119(e)(4)]

Transportation Demand Management (TDM) – Programs designed to reduce demand for transportation through various means, such as the use of transit and of alternative work hours.

[Integrating Demand Management into the Transportation Planning Process: A Desk Reference. <http://www.ops.fhwa.dot.gov/publications/fhwahop12035/>]

Transportation Improvement Program (TIP) – A prioritized listing/program of transportation projects covering a period of four years that is developed and formally adopted by an MPO as part of the metropolitan transportation planning process.

Must be consistent with the metropolitan transportation plan; required for projects to be eligible for funding under USC Title 23 and 49 USC Chapter 53.

[23 CFR Section 450.104.]

Transportation Management Area (TMA) – An urbanized area with a population over 200,000, as defined by the Bureau of Census and designated by the Secretary of Transportation, or any additional area where TMA designation is requested by the Governor and the MPO and designated by the Secretary of Transportation.

[23 CFR Section 450.104.]

Transportation Performance Management – Strategic approach that uses system information to make investment and policy decisions to achieve national performance goals.

[<http://www.fhwa.dot.gov/tpm/about/tpm.cfm>]

Transportation planning – A continuing, comprehensive, and cooperative (3-C) process to encourage and promote the development of a multimodal transportation system to ensure safe and efficient movement of people and goods while balancing environmental and community needs.

Statewide and metropolitan transportation planning processes are governed by Federal law and applicable state and local laws.

[Based on language found in 23 USC Sections 134 and 135.]

Transportation Safety Planning (TSP) – A comprehensive, system-wide, multimodal, proactive process that better integrates safety into surface transportation decision-making. Federal law requires that the State and Metropolitan transportation planning process be consistent with Strategic Highway Safety Plans. It is important for the process to consider projects and strategies to increase the safety of the transportation system for motorized and nonmotorized

users. State Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs) play the leading roles in transportation safety planning.

[<http://safety.fhwa.dot.gov/hsip/tsp/>]

Update – Making current a long-range statewide transportation plan, MPO, TIP, or STIP through a comprehensive review.

Updates require public review and comment, a 20-year horizon year for the MTPs and long-range statewide transportation plans, a four-year program period for TIPs and STIPs, demonstration of fiscal constraint (except for long-range statewide transportation plans), and a conformity determination (for MTPs and TIPs in nonattainment and maintenance areas.

[23 CFR Section 450.104.]

Vision – An agreed statement of the overall aims of a transportation plan; it describes the target end-state.

Relevant Reference Documents

AASHTO, *Executive Roundtable on Performance-based Planning and Programming*; held October 22-23, 2009, in Palm Desert, CA.

AASHTO, *A Primer on Performance-Based Highway Program Management: Examples from Select States*, January 2008. Available at:

http://www.ampo.org/assets/1012_primeronperformancebased.pdf

FHWA, *Asset Management and Management of Highway Performance*; held August 17, 2009 in Washington, DC. Prepared by Cambridge Systematics. Available at:

http://www.ampo.org/assets/1010_fhwapeerexchange.pdf

FHWA, *Performance-based Planning and Programming White Paper*, Prepared by Cambridge Systematics, May 2012. Available at:

http://www.fhwa.dot.gov/planning/performance_based_planning/resources/white_paper/

FHWA, *Congestion Management Process Guidebook*, April 2011, Prepared by ICF International. Available at:

http://www.fhwa.dot.gov/planning/congestion_management_process/cmp_guidebook/

FHWA and FTA, *Performance-based Planning and Performance Measures: Peer Exchange*; held July 13, 2010 in Minneapolis, MN. Available at:

http://planning.dot.gov/Peer/minnesota/minneapolis_2010.pdf

FHWA, *The Strategic Highway Safety Plan Implementation Process Model - The Essential Eight - Fundamental Elements and Effective Steps for SHSP Implementation*. Prepared by Cambridge Systematics, June 2010. Available at: <http://safety.fhwa.dot.gov/hsip/shsp/fhwasa10024/>

FHWA and FTA, *Incorporating Performance Measures into Regional Transportation Planning: Peer Exchange*; held February 24, 2010 in Washington, D.C. Available at:

http://planning.dot.gov/Peer/WashingtonDC/dc_2010.asp

FHWA and FTA, *Advancing Metropolitan Planning for Operations: An Objectives-Driven, Performance-Based Approach – A Guidebook*. Prepared by ICF International and SAIC, February 2010. Available at: <http://ops.fhwa.dot.gov/publications/fhwahop10026/index.htm>

FHWA and FTA, *Advancing Metropolitan Planning for Operations: The Building Blocks of a Model Transportation Plan Incorporating Operations - A Desk Reference*. Prepared by SAIC, Kittelson Associates, and ICF International, April 2010.

FHWA, *Roundtable on System Performance Measurement in Statewide and Metropolitan Transportation Planning: Peer Exchange*; held October 7-9, 2003 in Washington, DC. Prepared by the Volpe Center. Available at:

<http://www.planning.dot.gov/Peer/PerfMeasRT/PerfMeasRT.asp>

FHWA, Searchable Long Range Transportation Plan Database. Available at:

<http://www.planning.dot.gov/stateplans/default.aspx>

NCHRP Research Results Digest 361, *State DOT Public Transportation Performance Measures: State of the Practice and Future Needs*, Prepared by ICF International, September 2011.

Available at: <http://www.trb.org/Publications/Blurbs/166065.aspx>

NCHRP 20-24(58), *National Forum on Performance-Based Transportation Planning and Programming*, held in Dallas, Texas, September 13-15, 2010. Prepared by Cambridge Systematics. Materials available at:

<http://planning.transportation.org/Pages/NationalForumonPerformance-basedPlanningandProgramming.aspx>

NCHRP Report 666, *Target-Setting Methods & Data Management to Support Performance-Based Resource Allocation by Transportation Agencies: Volumes I and II; Volume III: Case Studies*. Prepared by Cambridge Systematics. Available at:

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_666.pdf

NCHRP 20-24(37), *Measuring Performance among State DOTs: Sharing Good Practices*. Project series available at: <http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=543>

NCHRP Report 446, *A Guidebook for Performance-Based Transportation Planning*, Prepared by Cambridge Systematics, 2000. Available at:

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_446.pdf

TCRP Report 88, *A Guidebook for Developing a Transit Performance-Measurement System*, Prepared by Kittelson & Associates, 2003. Available at:

http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_report_88/Guidebook.pdf

TRB, *Performance Measures to Improve Transportation Planning Practice: Peer Exchange*; held May 6, 2004 in Charleston, SC. Prepared by the Volpe Center. Available at:

<http://onlinepubs.trb.org/onlinepubs/circulars/ec073.pdf>



U.S. Department of Transportation
Federal Highway Administration

Office of Planning, Environment, & Realty (HEP)
1200 New Jersey Avenue SE
Washington, DC 20590

www.fhwa.dot.gov/planning/

September 2013

Publication No.: FHWA-HEP-13-041