Assessment on the Effectiveness of Performance-Based Planning and Programming

in Transportation Decision-Making for State Departments of Transportation and Metropolitan Planning Organizations




U.S. Department of Transportation
Federal Highway Administration
Federal Transit Administration

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16. Abstract

This report presents the findings of a study on how performance-based planning and programming influences transportation planning and programming decisions at 52 State departments of transportation and 85 metropolitan planning organizations. Research was conducted throughout 2020 using online reviews of planning and programming documents, interviews and peer exchanges with practitioners, and a survey of FHWA Division and Federal Transit Administration Region staff. This report documents current practices and identifies opportunities for enhancements.

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Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ACOG	Association of Central Oklahoma Governments
ARC	Atlanta Regional Commission
BMC	Baltimore Metropolitan Council (agency which houses and staffs the Baltimore Metropolitan Planning Organization and Baltimore Regional Transportation Board)
BRTB	Baltimore Regional Transportation Board (metropolitan planning organization for the Baltimore region)
CDTC	Capital District Transportation Committee
CMAQ	Congestion Mitigation and Air Quality Improvement
CMP	Congestion Management Process
COG	Council of Governments
COMPASS	Community Planning Association of Southwest Idaho
CORE	Coastal Region Metropolitan Planning Organization
COTA	Central Ohio Transit Authority
DC	District of Columbia
DOT	Department of Transportation
DOTD	Department of Transportation and Development
DRCOG	Denver Regional Council of Governments
DVRPC	Delaware Valley Regional Planning Commission
EJ	Environmental Justice
FAST Act	Fixing America's Surface Transportation Act
FAST Planning	Fairbanks Area Surface Transportation Planning
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GHG	Greenhouse Gas
GIS	Geographic Information System
HSIP	Highway Safety Improvement Program

INFRA	Federal Infrastructure for Rebuilding America
ITD	Idaho Transportation Department
KIPDA	Kentuckiana Regional Planning and Development Agency
KYTC	Kentucky Transportation Cabinet
LRSTP	Long-Range Statewide Transportation Plan
MAP-21	Moving Ahead for Progress in the 21st Century Act
MAPA	Metropolitan Area Planning Agency
MORPC	Mid-Ohio Regional Planning Commission
MPC	Metropolitan Planning Commission
MPO	Metropolitan Planning Organization
MTC	Metropolitan Transportation Commission
MTP	Metropolitan Transportation Plan (long-range transportation plan for MPOs)
MWCOG	Metropolitan Washington Council of Governments
NHS	National Highway System
NJTPA	North Jersey Transportation Planning Authority
NYMTC	New York Metropolitan Transportation Commission
PAG	Pima Association of Governments
PBPP	Performance-Based Planning and Programming
PM	Particulate Matter
PM-DIS	Performance Metrics: Data Integration System
RPC	Regional Planning Commission
RTPO	Regional Transportation Planning Organization
RTC	Regional Transportation Commission
RTP	Regional Transportation Plan
SANDAG	San Diego Association of Governments
SHIFT	Strategic Highway Investment Formula for Tomorrow
SHSP	Strategic Highway Safety Plan
SPR Work Program	State Planning and Research Work Program
STBG	Surface Transportation Block Grant

STIP	Statewide Transportation Improvement Program
TAM	Transit Asset Management [Plan][1]
TAMP	Transportation Asset Management Plan[2]
TDM	Transportation Demand Management
The Forks MPO	Grand Forks-East Grand Forks Metropolitan Planning Organization
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TOC	Table of Contents
TPB	Transportation Planning Board
TPM	Transportation Performance Management
TSMO	Transportation Systems Management and Operations
UPWP	Unified Planning Work Program
USDOT	United States Department of Transportation
UTA	Utah Transit Authority
Virginia OIPI	Virginia Office of Intermodal Planning and Investment
VMT	Vehicle-Miles Traveled
WFRC	Wasatch Front Regional Council
WILMAPCO	Wilmington Area Planning Council

[1] See 49 CFR 625.25.
[2] See 23 CFR 515.9.

Executive Summary

What Is Performance-Based Planning and Programming?

Performance-based planning and programming (PBPP) is how transportation planning agencies implement transportation performance management (TPM). TPM is a strategic, data-driven approach that uses system performance information to inform transportation investment and policy decisions to achieve performance goals. TPM involves setting goals and objectives, developing performance measures, establishing targets, using data on system performance to support strategy identification and investment prioritization, and conducting continual monitoring and adjustment.[3] TPM can be a tool that helps the State departments of transportation (DOTs), metropolitan planning organizations (MPOs), and public transit providers use information on past performance and forecasted conditions to guide investments, measure progress toward goals, and inform policy decisions.

PBPP applies TPM to the federally required statewide and metropolitan transportation planning and programming processes under 23 U.S.C. 134-135. These processes involve the development of long-range statewide transportation plans (LRSTPs), metropolitan transportation plans (MTPs), statewide and metropolitan transportation improvement programs (STIPs/TIPs), and other plans and activities associated with planning (e.g., data collection, collaboration with stakeholders, public engagement). PBPP enables the State DOTs, MPOs, public transit providers, and their planning partners to efficiently allocate resources and maximize the return on investments to achieve desired performance outcomes for the multimodal transportation system while increasing accountability and transparency to the public.

What Is the Purpose of This Report?

This report documents the key observations and findings of a Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) study that qualitatively assessed how PBPP is influencing transportation decisions at the State DOTs and MPOs. The key objectives of the study include:

- Documenting the state of the practice for PBPP, such as how agencies are carrying out their transportation planning processes to achieve the desired outcomes in FHWA's TPM Implementation Plan through PBPP requirements[4] and the FHWA and FTA performance measures.[5]
- Identifying noteworthy practices from the State DOTs and MPOs.
- Characterizing the types of investments and activities that the State DOTs and MPOs are programming in their STIPs/TIPs and planning work programs to make progress toward achieving performance targets and advance multimodal transportation system performance.
- Identifying ways that the State DOTs and MPOs can enhance their performance-based transportation planning processes.
- Describing areas for improvement in the state of practice.
- Sharing results with internal and external stakeholders.

[3] See 23 CFR Part 490, 23 CFR Part 924, 23 CFR Part 450, 49 CFR Part 613, and 23 CFR Part 515.
[4] See 23 U.S.C. 134 and 23 U.S.C. 135.
[5] See 23 CFR Part 490 and 49 CFR 625.43.

The study involved several components of research, including the following:

- A review of transportation plans and programming documents from all 52 State DOTs (including the District of Columbia and Puerto Rico) and a sample of 85 MPOs, representing urban areas of different sizes and geography, to identify practices associated with PBPP and integration into key planning products
- A review of a sample of State Planning and Research (SPR) Work Programs and MPO Unified Planning Work Programs (UPWPs) to identify research, data collection, studies, and other activities being undertaken by the State DOTs and MPOs to support PBPP
- A survey of staff at FHWA Division Offices and FTA Region Offices
- A series of interviews and peer exchanges with transportation agencies that were identified to have mature or potentially noteworthy PBPP practices to gather more detailed information and perspectives from transportation agencies on effective practices and challenges. Agencies were selected from the results of the online scan, supplemental research, and recommendations from FHWA and FTA.

It is important to note that the review of transportation plans and programming documents was conducted using documents available online; some of the materials reviewed were several years old. As a result, the results reflect practices at the time that the documents were developed but may not reflect the current activities that States and MPOs have been engaged in over the most recent years. See Appendix C, Methodology, for more details on the research methodology used.

Who Is the Audience for This Report?

This report aims to assist the State DOTs, MPOs, and public transit providers as they implement PBPP, not just to meet Federal regulations, but to meet their own goals for the performance of the transportation system. FHWA and FTA commissioned this study to assess the state of the practice for PBPP and to share ideas that practitioners can use to enhance their own processes.

This report is intended to help planning and programming staff from the State DOTs, MPOs, and partner agencies (e.g., public transit providers, FHWA, FTA); elected officials and transportation decision-makers; and any agency or individual interested in advancing the state of the practice for PBPP.

Is PBPP Helping the State DOTs and MPOs Achieve the Potential Benefits of TPM?

When FHWA published its TPM Implementation Plan in July 2018, FHWA laid out five key outcomes for national TPM implementation. Chapter 1 of this report describes the beneficial outcomes of PBPP identified in this study in relation to the desired TPM Implementation Plan outcomes. Each subsection details findings and examples from a variety of transportation agencies. Key takeaways for Chapter 1 are listed below:

- **Optimizing the Investment of Public Funds.** While transportation plan adoption and programming accounts for a wide array of policy considerations, the use of performance measures, targets, and project selection criteria brings a level of objectivity to developing and prioritizing investment priorities for the long-range plans and STIPs/TIPs. PBPP helps to put a focus on exploring the contribution of investments toward meeting desired performance targets and tradeoffs among investments.

- **Improving Consistency.** The use of national performance measures provides consistency in how transportation agencies measure some aspects of performance. The inclusion of system performance reports in LRSTPs and MTPs ensures that these plans report on performance, and as PBPP practices advance, they should assist in comparing and benchmarking goals and peers. Moreover, PBPP practices help to align efforts and priorities between States and MPOs within the State, and across modes, functional areas, and stakeholders.
- **Increasing Coordination Among Decision-Makers.** The Federal transportation planning coordination requirements for setting performance targets[6] have created opportunities to discuss State and regional concerns, identify shared priorities, and make process changes to improve the use of data in transportation planning and decision- making. As agencies develop terminology and priorities that are consistent with those of their stakeholders, coordination to achieve shared goals increases.
- **Increasing Agencies' Understanding of What Works.** As many agencies develop their performance-based planning practices, they are increasing their understanding of what strategies are most effective for meeting performance goals.
- **Communicating the Return on Investment.** Sharing performance-based information with the public and stakeholders can build trust, help in communicating the benefits associated with transportation investments, and help to justify cases in which additional funding may be needed to address performance gaps.

Is PBPP Influencing Transportation Decision-Making for the State DOTs and MPOs?

PBPP is helping States DOTs and MPOs to coordinate planning activities, make more informed investment decisions, and communicate performance-related data and information. Chapter 2 of this report describes performance-based activities and strategies that agencies found to be useful in their transportation planning and programming practices. Each subsection details the findings and examples from a variety of transportation agencies. Key takeaways for Chapter 2 are listed below:

- **Improving Coordination and Communications.** Federal regulations require transportation agencies to coordinate on establishing targets to ensure consistency and integrate the goals, objectives, performance measures, and targets from various plans into the statewide and metropolitan transportation planning.[7] Many agencies have strengthened their coordination across agencies, including with transit agencies, and across planning products. There are noteworthy examples of agencies collaborating on data collection and analysis methods, pooling resources through joint research, and aligning messaging to stakeholders and the public.
- **Enhancing Long-Range Planning.** Transportation agencies are using performance targets, system performance data, and prioritization criteria linked to performance to develop the long-range plan. Agencies are sharing performance data and needs with partners to help focus on investments, strategies, and/or projects that best address regional needs and priorities. While still a developing practice, some agencies are using scenario planning to analyze the impacts of different investment options on performance to shape project lists and priorities in the plan.
- **Enhancing Programming.** Similar to practices from long-range planning, some agencies are using project scoring or project selection criteria related to performance goals in order to

[6] See 23 CFR 450.206(c) and 23 CFR 450.306(d).
[7] See 23 CFR 450.206(c) and 23 CFR 450.306(d).

prioritize projects for funding, often within program funding areas (e.g., Highway Safety Improvement Program or Congestion Mitigation and Air Quality Improvement Program funding). It is important to note that the role agencies play in project selection varies, with some MPOs serving a facilitation role with member agencies, but not actually responsible for scoring or selecting projects for the TIP. Many of the State DOTs and MPOs have made efforts to link STIP/TIP projects to goals, performance measures, or targets to help demonstrate the contribution of these projects to supporting desired performance outcomes.

- **Maximizing Planning Work Programs.** SPR Work Programs and MPO UPWPs provide an opportunity for transportation agencies to take creative approaches to improve performance through targeted infrastructure improvement programs, research, grant funding, or other programs.

Are There Areas for Improvement in the State of the Practice?

Effective PBPP practices were found at every stage in planning and programming at State DOTs and MPOs nationwide, and all agencies are continuing to learn and refine their practices. The ideas throughout this report can be used to develop new performance-based practices or incorporate performance into established practices. Chapter 2 describes options and examples of how to use data to influence and enhance decisions throughout the planning and programming process. Chapter 3 provides more extensive examples from State DOTs and MPOs of various sizes (which often correlate with technical capacity). Staff at State DOTs and MPOs also may benefit from additional resources, tools, and skills for the following areas:

- Using performance measures to monitor progress toward agency goals.
- Analyzing previous projects and forecasting the impacts of future investments.
- Integrating performance into investment decisions through project evaluation criteria, prioritization processes, and scenario planning.
- Collaborating internally and externally to align performance-based planning.
- Communicating with decision-makers, stakeholders, and the public.

Which State DOTs and MPOs Are Represented in This Report?

The researchers found effective PBPP practices at every agency type and size. The online scan included all of the State DOTs, 31 small MPOs (population less than 200,000), 27 mid-sized MPOs (population between 200,000 and 1 million), and 27 large MPOs (population greater than 1 million). Seventeen of the MPOs reviewed serve as transit providers and 10 of them are multi-State MPOs.

This report includes examples from all categories of MPOs described above, and examples from States with population categories of up to 2 million (small DOTs), 2 million to 8 million (mid-sized DOTs), and greater than 8 million (large DOTs). While many PBPP practices are applicable to all agency types, some agencies have developed strategies that work well for agencies of a similar size. Readers of this report may find examples from their peers especially helpful in learning about PBPP activities and potentially applying them to their own practices.

Chapter 3 of this report provides case studies, organized by agency type, that describe a set of noteworthy activities and strategies in use by these agencies. These case studies are designed to illustrate how multiple performance-based activities work together to improve the transportation planning and programming process.

Table 1. List of the State DOTs referenced in this report by size.

Large DOTs	Mid-Sized DOTs	Small DOTs
California	Arkansas	District of Columbia
Florida	Colorado	Hawaii
Georgia	Connecticut	Idaho
Illinois	Indiana	Maine
New Jersey	Iowa	Nebraska
New York	Kansas	New Hampshire
North Carolina	Kentucky	Rhode Island
Ohio	Louisiana	South Dakota
Pennsylvania	Maryland	Vermont
Texas	Massachusetts	Wyoming
Virginia	Mississippi	
	Missouri	
	Nevada	
	New Mexico	
	Oklahoma	
	Oregon	
	South Carolina	
	Tennessee	
	Utah	
	Washington	
	Wisconsin	

Table 2. List of MPOs referenced in this report by size.

Large MPOs	Mid-Sized MPOs	Small MPOs
Association of Central Oklahoma Governments	Capital District Transportation Committee in New York	Cache MPO in Utah
Atlanta Regional Commission in Georgia	Capital Region Council of Governments in Connecticut	Casper Area MPO in Wyoming
Baltimore Regional Transportation Board in Maryland	Coastal Region (CORE) MPO in Georgia	Chittenden County Regional Planning Commission (RPC) in Vermont

Large MPOs	Mid-Sized MPOs	Small MPOs
Boston Region MPO in Massachusetts	Community Planning Association of Southwest Idaho (COMPASS)	Dixie MPO in Utah
Broward MPO in Florida	Des Moines Area MPO in Iowa	FAST Planning in Arkansas
Delaware Valley Regional Planning Commission in Pennsylvania/New Jersey	Genesee County Metropolitan Planning Commission in Michigan	Grand Forks-East Grand Forks (The Forks) MPO in North Dakota/Minnesota
Denver Regional Council of Governments (COG) in Colorado	Hernando/Citrus MPO in Florida	Hattiesburg-Petal-Forrest-Lamar MPO in Mississippi
East-West Gateway COG in Missouri/Illinois	Indian Nations COG in Oklahoma	Rockingham Planning Commission in New Hampshire
Hillsborough MPO in Florida	Knoxville Regional Transportation Planning Organization in Tennessee	Santa Fe MPO in New Mexico
Kentuckiana Regional Planning and Development Agency in Kentucky/Indiana	Madison Area Transportation Planning Board (TPB) in Wisconsin	Strafford RPC in New Hampshire
Memphis MPO in Tennessee/Mississippi	Metropolitan Area Planning Agency in Nebraska/Iowa	Walla Walla Valley MPO and Sub-Regional Transportation Planning Organization in Washington/ Oregon
Metro in Oregon	Michiana Area COG in Indiana	Yuma MPO in Arizona/California
Metropolitan Council in Minnesota	The Mid-Hudson Valley Transportation Management Area in New York[8]	
Metropolitan Transportation Commission in California	Mid-Region COG in New Mexico	
Mid-Ohio RPC	Mountainland Association of Governments in Utah	
National Capital Region TPB in DC/Virginia/Maryland	Pikes Peak Area COG in Colorado	
New Orleans RPC in Louisiana	Pima Association of Governments in Arizona	
New York Metropolitan Transportation Commission	Regional Transportation Commission of Washoe County in Nevada	
North Central Texas COG	Wichita Area MPO in Kansas	
North Jersey Transportation Planning Authority	Wilmington Area Planning Council in Delaware/Maryland	

[8] The Mid-Hudson Valley Transportation Management Area is a collaboration among three New York State MPOs: Dutchess County Transportation Council, Orange County Transportation Council, and Ulster County Transportation Council.

Large MPOs	Mid-Sized MPOs	Small MPOs
Regional Transportation Commission of Southern Nevada		
San Diego Association of Governments in California		
Southeastern Wisconsin Regional Planning Commission		
State Planning Council in Rhode Island		
Wasatch Front Regional Council in Utah		

Introduction

This introduction provides relevant background, a summary of the study and report's key objectives, and a quick reference guide to the report's structure and key audiences.

Background

Performance-based planning and programming (PBPP) is how transportation planning agencies implement transportation performance management (TPM). TPM is a strategic, data-driven approach that uses system performance information to inform transportation investment and policy decisions to achieve performance goals. TPM involves setting goals and objectives, developing performance measures, establishing targets, using data on system performance to support strategy identification and investment prioritization, and continual monitoring and adjustment.[9] TPM can be a tool to help the State departments of transportation (DOTs), metropolitan planning organizations (MPOs), and public transit providers use information on past performance and forecasted conditions to guide investments, measure progress toward goals, and inform policy decisions.

How TPM, Asset Management, and PBPP Work Together

- Transportation Performance Management (TPM) is an approach to managing transportation system performance outcomes. Transportation agencies apply TPM principles in making decisions about policies and where to invest resources.
- Asset management is the application of the TPM approach to manage the condition of transportation assets. Asset management processes, performance measures and targets, and investment strategies are documented in State Transportation Asset Management Plans (TAMPs) and Transit Asset Management (TAM) Plans.
- Transportation agencies use TAMPs and TAM Plans in their PBPP processes to help make policy and investment decisions and monitor progress toward their agency's goals, objectives, and targets.

PBPP applies TPM to the federally-required statewide and metropolitan transportation planning and programming processes. These processes involve the development of long-range statewide transportation plans (LRSTPs), metropolitan transportation plans (MTPs), statewide and metropolitan transportation improvement programs (STIPs/TIPs), and other plans and activities associated with planning (e.g., data collection, collaboration with stakeholders, public engagement). PBPP enables the State DOTs, MPOs, public transit providers, and their planning partners to efficiently allocate resources and maximize the return on investments to achieve the desired performance outcomes for the multimodal transportation system while increasing accountability and transparency to the public.

As noted previously, Federal laws and regulations establish requirements for the

[9] See 23 CFR Part 490, 23 CFR Part 924, 23 CFR Part 450, 49 CFR Part 613, and 23 CFR Part 515.

statewide and metropolitan transportation planning processes to use performance-based approaches. Among other things, the Moving Ahead for Progress in the 21st Century Act (MAP-21) enacted in July 2012[10] directed the United States Department of Transportation (USDOT) to establish performance measures based on national goals for safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays.[11] The Fixing America's Surface Transportation (FAST) Act enacted in December 2015 (Public Law 114-94) strengthened the focus on performance-based approaches.

USDOT rulemakings implementing both statutes continue this performance management framework. FHWA and FTA issued regulations to implement the performance management framework laid out by the statutes:

- In March 2016, FHWA published a final rule[12] for performance measures on highway safety (PM1).
- In May 2016, FHWA and FTA jointly issued a final rule[13] on statewide, metropolitan, and nonmetropolitan transportation planning requirements for the State DOTs, MPOs, and public transit providers, including:
  - » Developing jointly agreed upon specific written provisions.
  - » Coordinating and establishing performance targets.
  - » Integrating performance-based plans and processes.
  - » Evaluating past condition and performance, documenting targets, and reporting progress.
  - » Linking investment priorities to targets and describing anticipated future target achievement.
- In July 2016, FTA issued a final rule[14] for performance measures on transit asset management.
- In January 2017, FHWA issued a final rule[15] for performance measures on pavement and bridge conditions (PM2), and a final rule[16] for performance measures on travel-time reliability, freight reliability, traffic congestion, and on-road mobile source emissions (PM3).
- In July 2018, FTA issued a final rule[17] for performance measures on public transit safety.

FHWA and FTA are committed to supporting effective implementation of TPM and PBPP to ensure that the State DOTs, MPOs, and public transit providers are using a performance-based approach in their transportation planning and programming processes, establishing meaningful targets for the performance measures, and reporting at a level of detail needed for a national conversation on transportation performance.

[10] Public Law 112-141.
[11] See 23 U.S.C. 150.
[12] 81 FR 13881 (Mar. 15, 2016) (23 CFR Part 490).
[13] 81 FR 34049 (May 27, 2016) (23 CFR Part 450 and 49 CFR Part 613).
[14] 81 FR 48889 (July 26, 2016) (49 CFR Part 625).
[15] 82 FR 5886 (Jan. 18, 2017) (23 CFR Part 490).
[16] 82 FR 5970 (Jan. 18, 2017) (23 CFR Part 490).
[17] 83 FR 34418 (July 19, 2018) (49 CFR Part 673).

Objective of This Study and Report

This report documents the key observations and findings of an FHWA and FTA study that qualitatively assessed how PBPP is influencing transportation decisions for the State DOTs and MPOs. The key objectives of the study include:

- Documenting the state of the practice for PBPP, such as how agencies are carrying out their transportation planning processes to achieve the desired outcomes in FHWA's TPM Implementation Plan.
- Identifying noteworthy practices from the State DOTs and MPOs.
- Characterizing the types of investments and activities that the State DOTs and MPOs are programming in their STIP/TIPs and planning work programs to make progress toward achieving performance targets and improving performance of the multimodal transportation system.
- Identifying ways that the State DOTs and MPOs can enhance their performance-based transportation planning processes.
- Describing areas for improvement in the state of practice.
- Sharing the results with internal and external stakeholders.

The study involved several components of research, including the following:

- A review of transportation plans and programming documents from all 52 State DOTs (including the District of Columbia and Puerto Rico) and a diverse sample of 85 MPOs to identify practices associated with PBPP and integration into key planning products
- A review of a sample of State Planning and Research (SPR) Work Programs and MPO Unified Planning Work Programs (UPWPs) to identify research, data collection, studies, and other activities undertaken by the State DOTs and MPOs to support PBPP
- A survey of the staff of the FHWA Divisions and FTA Regions asking for examples of PBPP practices that influenced transportation planning or programming decisions
- A series of interviews and virtual peer exchanges with transportation agencies to gather more detailed information and perspectives from transportation agencies on effective practices and challenges. Agencies were selected from the results of the online scan, supplemental research, and recommendations from FHWA and FTA.

It is important to note that the review of transportation plans and programming documents was conducted using documents available online and that some of the plans and STIPs/TIPs may be outdated. As a result, the results reflect practices at the time that the documents were developed but may not reflect the current activities that States and MPOs have been engaged in over the most recent years. See Appendix C, Methodology, for more details on the research methodology used.

Quick Reference Guide and Key Audiences

The report is organized into the following chapters, based on the needs of several key audience types:

- **Chapter 1. Beneficial Outcomes of PBPP and TPM:** The key audience for Chapter 1 includes FHWA and stakeholders interested in the benefits of PBPP and how PBPP is supporting the achievement of the desired national outcomes. Chapter 1 includes the following sections, focusing on the five outcomes in FHWA's TPM Implementation Plan:

  - » Optimizing the Investment of Public Funds
  - » Improving Consistency
  - » Increasing Coordination Among Decision-Makers
  - » Increasing Our Understanding of What Works
  - » Communicating the Return on Investment

- **Chapter 2. Current Practices in Applying PBPP**: The key audience for Chapter 2 includes practitioners interested in applications of PBPP to support their existing planning processes. Chapter 2 includes the following sections:
  - » Improving Coordination and Communications
  - » Enhancing Long-Range Planning
  - » Enhancing Programming
  - » Maximizing Planning Work Programs
- **Chapter 3. Noteworthy Examples by Agency Types:** The key audience for Chapter 3 includes practitioners interested in more in-depth descriptions of applications of PBPP by peer agencies to consider how they may replicate the application. Chapter 3 includes the following sections:
  - » State DOTs: Provides examples of practices by States that have integrated PBPP into statewide planning and programming processes.
  - » MPOs: Provides examples of practices by MPOs of various sizes.
- **Appendices:**
  - » A. Bibliography
  - » B. Acknowledgments
  - » C. Methodology
  - » D. Performance Measures Beyond Federal Requirements
  - » E. Planning Work Program Strategies and Activities by Performance Topic

This report provides the reader with sources in three different ways:

1. Footnotes are used to provide context that is important for the reader to have easy access to while reading. For example, one footnote provides a link to the Virginia Office of Intermodal Planning and Investment's evaluation tool following a discussion of that tool.
2. When describing a specific practice for which a citation is needed, the report uses endnotes to provide the source (except in some instances, where the source is apparent from the context of the sentence). Endnotes appear at the end of each chapter. For example, in a peer exchange, Fairbanks Area Surface Transportation Planning (FAST Planning) shared that a safety improvement and roundabout conversion program reduced serious injuries and fatalities at targeted intersections. That peer exchange is cited in the endnotes.
3. A bibliography provides an alphabetical list of all the sources cited in the report.

Chapter 1. Beneficial Outcomes of PBPP and TPM

Performance-based planning and programming (PBPP) and transportation performance management (TPM) approaches have numerous benefits, which align with the five desired outcomes of the Transportation Performance Management (TPM) Implementation Plan published by the Federal Highway Administration's (FHWA) Office of Infrastructure in July 2018. The FHWA TPM Implementation Plan articulates five key desired outcomes for national TPM implementation:

1. Optimizing the investment of public funds.
2. Improving consistency across the country.
3. Increasing the coordination of decision-makers.
4. Increasing our understanding of what works.
5. Communicating Federal investment returns.

This chapter shares findings regarding how the implementation of PBPP activities by the State departments of transportation (DOTs), metropolitan planning organizations (MPOs), and their planning partners is contributing to achieving these beneficial outcomes. While transportation agencies of different types and sizes across the country vary in maturity and the approaches to PBPP, this study found examples and testimonials of beneficial outcomes from all types of agencies, addressing each of the five key desired outcomes listed above.

Optimizing the Investment of Public Funds

With limited funding for transportation projects and programs, a primary role of a transportation agency is to determine where to invest public dollars to achieve desired goals and maximize the return on investment. A first step in optimizing the investment of public funds is to determine which performance goals are priorities for the transportation system, and then identify transportation projects or programs that will address those priorities.

FHWA TPM Implementation Plan Description

- "Transportation funding is limited, so we must maximize the return on the investment of the public dollars entrusted to transportation agencies and planning organizations."
- "Better decisions, made with the overall system performance in mind, will result in the best "mix" of investments that will collectively maximize the performance gains of the system."

(FHWA TPM Implementation Plan, page 2)

Establishing performance measures and targets helps agencies by providing a specific, agreed upon way to assess progress toward goals. Analyzing data on performance helps agencies understand the state of the transportation system and identify needs or gaps in performance. Data-driven analyses help to investigate the causes of those gaps, assess the performance implications of alternative funding decisions, and use the information to determine how best to prioritize investments to reach performance targets.

In 2020, many transportation agencies were in the early stages of developing a performance-based planning approach. Some agencies were using performance measures to begin tracking performance and trends in each area, while others had begun to use those measures and targets to influence planning or programming decisions. Many agencies noted that the use of performance measures to influence decisions leads them to find more effective ways of investing than they had used in the past.

Within the virtual peer exchanges conducted for this study, approximately two-thirds of the MPOs and half of the State DOTs indicated that performance data help their decision-making boards make data-driven decisions, help agencies engage with the public and stakeholders during the planning process, and encourage planning partners to make investments that will advance regional goals.

> "[PBPP] helps us score better, rank the projects, prioritize, and realize that we have limited fiscal resources. Performance data have helped us prioritize and make a better plan."
>
> –The Des Moines Area MPO

Performance Data and Targets Help Optimize Investments

Data on existing conditions and performance can help planning partners, decision-makers, and the public clearly identify gaps or deficiencies to address. The State DOTs and MPOs use system performance reports to provide information about the condition and performance of transportation systems to partners, decision-makers, stakeholders, and the public. A system performance report evaluating the condition and performance of the transportation system with respect to performance targets is required within the long-range statewide transportation plans (LRSTPs) and metropolitan transportation plans (MTPs) (23 Code of Federal Regulations [CFR] 450.216 and 23 CFR 450.324, respectively); however, many of the plans reviewed as part of the online scan were developed before these requirements were in effect. Still, the online scan of long-range plans and statewide and metropolitan transportation improvement programs (STIPs/TIPs) for this study revealed that most agencies had published system performance information in some form, whether on an online dashboard, in an illustrative report, or in a detailed technical document.

Setting targets and tracking performance in relation to the targets can be useful for the State DOTs, MPOs, and their planning partners to identify what types of performance gaps or deficiencies are occurring. Further analysis of the data also can be helpful to understand the causes or locations of performance deficiencies to help prioritize the types of strategies or investments to address these gaps. Planning partners can use the data from system performance reports to ensure that the public can better understand system needs and proposed plans and facilitate a focus on investments to address the identified needs.

- The **Mid-Ohio Regional Planning Commission (MORPC)**, the MPO for the greater Columbus region, publishes easy-to-read monthly report cards that provide information about the existing condition and performance of the transportation system in relation to regional goals. MORPC's planning partners have found these report cards valuable as a quick reference and resource on the "big picture" context of the state of the transportation system. The report cards are especially helpful to smaller municipal planning partners who have limited access to data. The statistics

provided in the report cards have helped MORPC clearly convey the agency's key priorities with decision-makers and the public.[1]

- The **Pima Association of Governments**, the MPO for the Tucson, Arizona region, maintains an interactive data portal that catalogs system condition and performance information in a geographic database. The database helps planning partners understand system condition issues and performance across the transportation network and identify known deficiencies. The portal overlays local projects for submission to the TIP to determine whether the project's goals are addressing the issues identified for that area. Member agencies can then adjust their projects to ensure that they are linking their proposed transportation improvements to the goals and needs outlined in the MTP. Moreover, through this process, data are readily available to support corridor plans, which are developed to address those needs.[2]
- The **Tennessee DOT** uses a highway deficiency analysis tool to help develop its 10-Year Strategic Plan. The tool utilizes information from the statewide travel demand model, American Community Survey, Tennessee Roadway Information Management System, and Highway Safety Improvement Program (HSIP), among other data sources, to display scores across an array of performance measures to identify top segments with deficiencies, such as structural deficiencies, bicyclist/pedestrian level of service, and freight infrastructure. The tool can be used to support project prioritization and also can be made available to MPOs so they can better understand system deficiencies for use in their own analyses.[3]

Performance targets provide a clear, quantifiable, path to achieving goals for the transportation system. Performance data analysis equips agencies with the knowledge to make the best decisions to realize their transportation vision and goals. Priorities may change based on this data analysis. In some cases, agencies may set targets for various points in time showing incremental progress toward goals and helping to support the funding of projects along the target pathway.

- The **Metropolitan Area Planning Agency (MAPA)**, the MPO for the Omaha, Nebraska and Council Bluffs, Iowa region, completed a travel improvement study in partnership with the **Nebraska DOT** to look at Interstate corridors in the region and a set of priority corridors (largely comprised of the National Highway System [NHS]). They used a performance-based approach to (1) collaborate with the State DOT to establish performance measures and (2) set targets and prioritize projects on the NHS. By using PBP, it became evident to both MAPA and the Nebraska DOT that preservation was a priority for both, especially once the agencies began to discuss fiscal constraints. Collaboratively setting targets allowed the agencies to arrive at shared priorities for investments in a way that they had not been able to do in the past.[4]
- **MORPC** in Ohio created targets for developing sidewalks on arterial roads by 2020 (40 percent of arterials would have a sidewalk) and 2040 (85 percent of arterials would have a sidewalk). The agency wanted to set milestones to demonstrate progress toward achieving the ultimate goal of including a sidewalk on every arterial in the region, and the interim targets would provide a way to support a focus on funding these priorities.[5]

Data-Driven Project Selection Criteria Helps Optimize Investments

Data-driven project selection criteria bring a level of objectivity to developing project lists to ensure that the investments will help make progress toward agency goals. Under a PBPP approach, agencies may develop project selection criteria for the long-range transportation plan, for a specific program (for example, the HSIP), or for the STIP/TIP in order to make a clear connection between goals and project implementation. Most agencies that use project selection criteria use them

to inform decision-making, bringing data and analysis into the discussion, but not solely relying on these criteria. Many decision-makers continue to finalize project lists through discussions that may involve regional distribution of funding or projects, projects that were identified as priorities by external stakeholders or initiatives, or other factors such as those that may be required by State or local law. Publishing project scores and the prioritization process can help to provide a more objective way of evaluating potential projects.

- The **Des Moines Area MPO**, in Iowa, uses performance-based measures to evaluate projects to include in its MTP. The agency uses these measures to communicate needs and priorities to member agencies, which has shifted the type of projects submitted. Projects in the newer MTPs now tend to focus on reconstruction and preservation, as opposed to expansion projects.
- The **Genesee County Metropolitan Planning Commission**, the MPO for the Flint, Michigan region, uses an objective, data-driven prioritization process for its TIP. Projects are scored using criteria developed jointly by the MPO and its member agencies. All member agencies support the process and unanimously approve the TIP each cycle, even if their own projects are not selected for funding, due to the transparency of the process.[6]

Using performance measures and targets can help to identify transportation projects that address improvements in multiple performance areas or examine tradeoffs among performance areas. Agencies may consider multiple goal areas and targets in the process of prioritizing projects for selection in a long-range plan, STIP, or TIP in order to help make progress toward multiple goals at the same time, rather than simply looking at individual performance areas separately. This approach can help to maximize the value of these investments.

- **FAST Planning** in Alaska looks for opportunities among Congestion Mitigation and Air Quality Improvement (CMAQ) Program-funded projects to address performance in additional areas. They created a matrix that shows how CMAQ projects impact other performance areas, such as safety.[7]
- The **Walla Walla Valley MPO**, in Washington and Oregon, has followed a project selection process that was performance-based, even before the Federal performance measure rulemakings were fully complete. Due to the small amount of funding available as a small MPO, they try to identify projects that impact multiple performance areas.[8]

Linking performance measures to project or investment decision-making may be a next step for some agencies as their practices mature. Regarding MPOs, it is important to note that the degree of influence that agencies have in project selection and other investment decisions varies. MPOs often serve a facilitation role with member agencies to advance projects for prioritization. In instances where MPOs are involved in prioritization, they typically use different sets of scoring criteria for individual program areas (e.g., safety, transit) as opposed to a single set of criteria for all individual projects.

Scenario Planning Approaches Help Optimize Investments Across Performance Areas

Scenario planning or similar tradeoff analyses can help agencies prioritize investments that can best address their goals for the transportation system. When an agency sets performance targets, how will they work to meet these targets? Agencies that use a scenario planning process can compare different packages of projects or levels of funding across transportation project categories

to identify investments that will make the most progress toward meeting performance targets. Analyzing the projected impacts of the transportation projects or investments helps decision-makers make informed decisions.

- As part of the development of the 2040 Multimodal Transportation Plan (published in 2014), the **South Carolina DOT** analyzed five alternative resource allocation scenarios reflecting different priorities and areas of emphasis in capital investments: (1) baseline (focusing on the core highway system, similar to current program distributions), (2) multimodal system (allocate resources to expand highway, transit, rail, and nonmotorized systems linking cities and towns), (3) serve the economic drivers (resources focused on ports, distribution facilities, airports, and leisure destinations), (4) reduce system size (transfer ownership of roughly 50 percent of the non-Federal Aid highway system to counties and municipalities), and (5) preservation (focusing on maintaining highways and bridges). The scenarios were compared in relation to performance measures, including highway user costs, pavement condition, bridges in good condition, congestion, and nonmotorized and transit support. The analysis revealed that no one investment scenario optimally addressed the performance of the system, but that a strategic focus would be needed, which could include shifting funding to system preservation while relying on non-Federal sources to address mobility needs.[9]
- The **Mid-Region Council of Governments (Mid-Region COG)**, the MPO for the Albuquerque, New Mexico region, compared a target scenario and a trends scenario. The MPO used its regional travel demand model and a land use model to develop a target scenario based on the region's goals. The Mid-Region COG then compared the scenarios by goal areas and performance metrics to help identify a mix of investments and policies to best support the goals.[10]

The estimated impacts of projects, strategies, or other investments can help agencies determine which types of strategies or programs to prioritize to best address performance needs. Federal performance measures have helped agencies identify the most cost-effective strategies in which to invest.

- The **Delaware Valley Regional Planning Commission (DVRPC)**, the MPO for the Philadelphia region, covering parts of Pennsylvania and New Jersey, used its travel demand model to estimate the impact of operational improvements and system expansions on hours of delay. The model showed that operational improvements reduced congestion more cost effectively, so DVRPC shifted to prioritizing operational improvements in the MTP.[11]
- The **North Central Texas Council of Governments (North Central Texas COG)**, the MPO for the Dallas/Fort Worth region, identified bridges in "poor" and "moderate" conditions in coordination with the Dallas, Fort Worth, and Paris districts of the **Texas DOT**. With this data, the North Central Texas COG looked at available revenue and the MTP to see which bridges might be funded as part of roadway projects in the short term, and identified funding sources to fix these bridges. The partners also looked at which bridges were in moderate condition to prevent these bridges from reaching a poor condition. Together, the partners were able to get funding for some projects by pursuing competitive grants to improve the bridges through the Federal Infrastructure for Rebuilding America (INFRA) Grant Program, and using the performance measures to help secure additional funding.[12, 13]
- The **Community Planning Association of Southwest Idaho (COMPASS)**, the MPO for the Boise region, conducted a comparison of proposed investment scenarios, both individual projects and clusters of projects, and engaged decision-makers to set priorities based on the

performance-based assessments. Specifically, COMPASS used its travel demand forecasting model to compare the complete funded system against the same complete funded system plus each unfunded project individually to assess changes in performance if the project was to be funded. Outputs included differences in vehicle-miles traveled (VMT), congested VMT, and vehicle-hours of delay. The prioritized unfunded project lists represent priorities that will be used as a basis for seeking additional funding and budgeting if new funding becomes available.[14]

Improving Consistency

Using nationally consistent performance measures allows agencies to share methodologies, effective practices, and compare progress with other agencies across the country. Consistent datasets and practices can allow agencies to use the same types of data and even the same tools, which can reduce time and effort needed to develop unique approaches. Moreover, consistency in measuring performance helps agencies work with their planning partners on joint initiatives, measuring progress in the same way. Coordination with other performance-based plans reduces duplication of work and helps advance priorities collectively across a State or region.

FHWA TPM Implementation Plan Description

- "Many States are already involved in performance management decision-making today. Consistency in terminology, standards, and metrics will result in an easier transfer of knowledge so that we can hold an effective national conversation on transportation performance and develop valuable national performance reports."
- "We will strive for measures that can be implemented and that are meaningful rather than the lowest common denominator. The easiest measure is not necessarily the best."

(FHWA TPM Implementation Plan, page 2)

Consistency in the Use of Performance Measures Across the Nation

Federal TPM regulations have led transportation agencies to use some consistent measures across the board in relation to safety (Performance Measure [PM] 1); bridge and pavement conditions (PM2); and system performance issues such as reliability, freight movement, congestion, and emissions reduction (PM3).[18] The State DOTs and MPOs have begun to incorporate the national performance measures into their long-range plans and STIPs/TIPs.

Most LRSTPs, metropolitan transportation plans (MTPs), and STIPs/TIPs analyzed in the online scan for this study that were published in or after 2018 included some or all of the Federal performance measures.

- LRSTPs: Of the 13 LRSTPs published in 2018 or later, 10 (77 percent) included at least one Federal performance measure.

[18] See 23 CFR 490.207, 23 CFR 490.307, 23 CFR 490.407, 23 CFR 490.507, 23 CFR 490.607, and 23 CFR 490.807.

- MTPs: Of the 54 MTPs published in 2018 or later, 46 (85 percent) included at least one Federal performance measure.
- STIPs: Of the 44 STIPs published in 2018 or later, 28 (64 percent) included at least one Federal performance measure.
- TIPs: Of the 71 TIPs published in 2018 or later, 58 (82 percent) included at least one Federal performance measure.

It should be noted that many of the LRSTPs and MTPs reviewed may be outdated. Approximately 60 percent of all LRSTPs reviewed were published in or prior to 2015, and around 10 percent were published after January 2019. Approximately 10 percent of all MTPs reviewed were published in or prior to 2015, and almost 50 percent were published after January 2019. In contrast, all STIPs/TIPs reviewed were adopted after January 2017. Approximately half of the STIPs/TIPs were adopted in 2019, and around 15 percent were adopted in 2020, after most of the national performance measures were required. It is anticipated that all plans and programming documents moving forward will reference the national performance measures and targets established by the State or MPO.

Consistency in data is helpful to understand the performance of the transportation system in relation to peers or the country. Working with the same performance measures can facilitate conversations among peer agencies because the agencies come to the conversation with an understanding of the performance measures context for all agencies.

Using consistent performance measures and data sources can be helpful in coordination among State, local, and regional agencies. When all agencies are using the same data to analyze the problems and potential solutions to those problems, it is easier to identify priorities, advance strategies to address those issues, and compare projects.

- The **Baltimore Regional Transportation Board (BRTB)** coordinated with the **Maryland DOT** to analyze data when deciding whether to adopt State targets. BRTB evaluated Federal requirements and State targets to determine whether State targets aligned with BRTB statistics and priorities. Ultimately, BRTB adopted many agency-specific targets for Federal measures; however, these could be compared and analyzed in relation to the State's targets because of consistency in the use of data and analysis methods.[15]
- The **Missouri DOT**, for many years, has been a model for data coordination, sharing a wide array of data with its 9 MPOs and 19 regional planning commissions (RPCs) through its Transportation Management System. In 2016, the Missouri DOT developed a web-based tool to make it easy for users to extract data from the Transportation Management System and started conducting statewide planning partner meetings annually. Having consistent data and performance information used across the many MPOs and RPCs helps in understanding performance issues and needs across the State.
- The **Texas DOT** uses a cloud-based performance evaluation tool to help evaluate deficiencies and maintain project data. Texas DOT districts and MPOs can enter project data into the tool and can assess their priority projects, adjust them based on needs, and rank them for the Unified Transportation Plan. Prior to the Texas DOT utilizing this tool, these agencies evaluated project data using inconsistent methods, which made it difficult to compare projects.[16]

Consistency in Planning Priorities Among States, MPOs, and Other Partners

Beyond the ability to assess performance using consistent measures, a performance-based approach that involves clearly defining goals, objectives, performance measures, and targets can help to support consistency in planning priorities among States, MPOs, and other partners, including public transit providers and local agencies.

- Because **PennDOT** (the Pennsylvania DOT) is updating its LRSTP, the agency wants it to become a roadmap that sets a direction for MPOs and regional transportation planning organizations (RTPOs) to inform the development of their transportation plans and for use in selecting regional TIP projects.
- The **Nevada DOT**, in coordination with MPOs and public transit providers, supports and integrates performance-based planning activities into long-range planning efforts. The One Nevada Transportation Plan establishes a framework and action plan to link statewide and regional performance-based planning activities and provides a direct link among statewide/agency plans, national goals, and planning factors.
- As part of the update to its LRSTP, the **New York State DOT** is developing an integration framework that involves an assessment of goals, objectives, performance measures, and strategies across each of the State's 14 MPOs in order to align the many planning documents and ensure that the statewide plan reflects regional stakeholder and public priorities.
- The **Utah DOT** has a unified planning framework that results in the development of Utah's Unified Transportation Plan. The planning effort involves coordination of plans across each of the State's four MPOs, the **Cache Valley MPO, Wasatch Front Regional Council, Mountainland Association of Governments, and the Dixie MPO**, as well as the **Utah Transit Authority**. At the start of each planning cycle, the agencies establish common planning time horizons and update cycles; goals, objectives, and performance measures; highway and transit project evaluation criteria; and financial assumptions regarding current and future revenue. Using these common elements, each agency prepares a long-range plan that addresses the needs and interests of its area, and the agencies coordinate with the partner agencies. The resulting plans are assembled to create the Unified Transportation Plan.[17]

Consistency Among Performance-Based Plans

In addition to consistency across jurisdictions, a PBPP approach improves consistency across various statewide and metropolitan planning activities. The State DOTs produce performance-based plans in addition to the LRSTP and STIP, including (but not limited to) the HSIP, Strategic Highway Safety Plan (SHSP), State Transportation Asset Management Plan for the National Highway System (NHS), and the State freight plan; large MPOs subject to the requirements produce a Congestion Mitigation and Air Quality Improvement (CMAQ) performance plan[19] and implement a congestion management process (CMP).[20] In addition, public transit providers develop a Transit Asset Management Plan and Public Transportation Agency Safety Plan. All of these plans include critical information to inform long-range plans and STIPs/TIPs, and the vision and goals from long-range

[19] See 23 U.S.C. 149(l) and 23 CFR 490.107.
[20] See 23 U.S.C. 134(k)(3)(C).

plans also provide direction that should inform the development of these other performance-based plans.

Many performance-based plans provide performance or system condition data for their functional area, and some include lists of projects anticipated to improve performance in that area. Transportation agencies can use this content to support the existing conditions and system needs sections of their long-range transportation plan and support developing project lists and priorities for comparing potential tradeoffs among the various performance areas. Coordinating these plans helps agencies work together to advance projects that are anticipated to improve performance across multiple goal areas.

Coordinating performance-based plans can help align priorities among modes and functional areas to better coordinate joint efforts and initiatives. While many of these performance-based plans are new, there are already signs that long-range plans and STIPs/TIPs are being influenced by the earliest developed performance-based plans. According to the online scan conducted in this study, a State's Transportation Asset Management Plan[21] was the most likely of all the performance-based plans to have a documented influence on the plan, followed by the SHSP and the HSIP. The scan included plans from a range of publication dates, and as would be expected, plans adopted in recent years were more likely than older plans to demonstrate coordination with related performance-based plans.

- Performance-based planning has had a visible impact at the **Hawaii DOT** in the transportation asset management arena. The Hawaii DOT is shifting from a "worst first" to a "life cycle" approach to bridge and pavement asset management as identified in the State's Transportation Asset Management Plan. The TPM requirements and PBPP influenced this shift in project selection strategies. Now, the Hawaii DOT has adopted unit cost pricing and invests more in preventative expenditures for bridges (e.g., scour countermeasures, joint repairs, deck repairs).[18]
- The **Iowa DOT** has a statewide transportation plan called Iowa in Motion 2045 (completed in 2018), and a series of modal plans, including an Aviation Plan, Bicyclist/Pedestrian Plan, Rail Transportation Plan, and Public Transit Plan, as well as a range of specialized/system plans such as the State freight plan, Transportation Asset Management Plan, Interstate Corridor Plan, and Park and Ride System Plan. The LRSTP provides information on each of the modes and references the various plans that lay out more specific priorities. For example, the LRSTP notes that the Bicyclist/Pedestrian Plan will serve as the primary guide for Iowa DOT decision-making regarding bicyclist and pedestrian programs and facilities. The Bicyclist/Pedestrian Plan also has applicability for regional, county, and city plans and programs, helping to achieve a better level of statewide coordination and continuity for all levels of bicyclist/pedestrian mobility.[19]

Using performance-based selection criteria for investments can standardize the decision-making process, leading to a consistent methodology for project selection. As an example, the **Colorado DOT** is developing a methodology for facilitating investment decision-making. The Colorado DOT is using Multi-Objective Decision Analysis, a framework for making complex decisions involving multiple goal areas and stakeholders. Using Multi-Objective Decision Analysis, decision-makers can effectively consider a set of criteria, tradeoffs, and expected outcomes. The Colorado DOT aims to develop this method so that decision-makers can select projects that align with the

[21] As required under 23 U.S.C. 119(e).

goals outlined in the LRSTP. The intention is to improve consistency in the project selection process, incorporate data into the process, facilitate stakeholder engagement, and maximize dollars spent.[20]

Increasing Coordination Among Decision-Makers

While coordination is a long-standing practice in transportation planning, the performance-based planning approach has required some specific coordination and interaction activities that have yielded positive results.

Interagency coordination allows planning partners to work together to advance shared priorities. The coordination first helps agencies understand how they are aligned with respect to priorities; identifying shared priorities allows agencies to work together to make systematic improvements in selected areas. Agencies find value in sharing data. Sharing data reduces redundant data-gathering activities and helps ensure that the agencies are using the same type of metrics to measure progress.

FHWA TPM Implementation Plan Description

- "State DOTs, MPOs, transit agencies, local governments, and others all share in the responsibility to support national performance needs through their local decision-making."
- "The planning process, a tool that already exists, is a key part of successful coordination. We will build on what is already working there."

(FHWA TPM Implementation Plan, page 2)

Federal Coordination Requirements Resulted in Improved Relationships

Federal regulations have requirements for the State DOTs and MPOs to coordinate with partner agencies on establishing performance targets (see, for example, 23 CFR 450.206 and 450.306). Agencies have found that the practice of working with partner agencies to set targets often revealed other shared priorities or needed follow-up coordination.

The coordination requirements have resulted in positive outcomes in relationships between the State DOTs and MPOs. The required coordination provided an opportunity to discuss State and regional concerns; identify shared priorities; and make process changes to improve data procurement, analysis, and planning.

- The **Virginia Office of Intermodal Planning and Investment (OIPI)** organizes a quarterly meeting with MPOs to discuss performance measures and targets. The FHWA Virginia Division noted that PBPP has allowed the DOT to "more purposefully engage MPOs than in the past."
- The **New Orleans Regional Planning Commission**, in Louisiana, began sharing congestion data and transit conditions data with the **Louisiana Department of Transportation and Development (DOTD)**, which helped the Louisiana DOTD better understand the MPO's concerns and priorities.
- The **Metropolitan Council**, the MPO for Minneapolis/St. Paul, Minnesota, created a group consisting of local, State, and Federal partners, focused on selecting performance measures for the CMP. Developing CMP measures "provided a forum to discuss priorities and desired outcomes for the region and greatly increased communication/coordination on congestion between [the MPO] and its partners. This ultimately led to a broader discussion of

how the region should measure and think about mobility issues, and helped to unite regional organizations toward an agreed-upon reliability vision for the future."[21]

Target-establishment coordination can prompt agencies to work together to share data to be able to track their progress toward meeting targets, along with other planning analyses.

- **The Metropolitan Area Planning Agency (MAPA)**, the MPO for the Omaha, Nebraska-Council Bluffs, Iowa region, did not have routine access to crash data. The agency used the discussions related to establishing targets to also clarify their role in regional data analysis, obtain more routine access to data, and share and talk about data more publicly. MAPA, which is a bi-State MPO, noted that one of the most important parts of PBPP has been creating an open dialogue among key stakeholders. In particular, the transit asset management planning requirement has helped the MPO get on the same page as public transit providers, such as the **Omaha Metro Transit Agency and the Council Bluffs Special Transit Service**. The quantitative data collection process is new to public transit providers and has helped them go after competitive grants, address a backlog of projects, and achieve a transit state of good repair.[22]
- In 2014, each of the New Hampshire MPOs (the **Strafford MPO, Southern New Hampshire Planning Commission, Rockingham Planning Commission, and the Nashua Regional Planning Commission**) organized a year-long collaborative series of workshops, called Partnering for Performance NH, funded by a grant from the FHWA Strategic Highway Research Program 2 (SHRP2) PlanWorks Implementation Assistance Program. Working in partnership with the New Hampshire DOT, the goal of the program was to develop performance measures and track data to meet federally-mandated measures and additional, complementary regional performance measures. Since the workgroup created a strong framework for interagency collaboration and communication, the members decided to continue coordinating beyond the SHRP2 effort. Because each MPO has limited staff, the partnership enables MPOs to divide responsibilities to avoid duplication while pooling resources.[23]

Discussions about establishing targets can highlight significant needs and prompt agencies to develop new strategies or programs to address those needs. By bringing the State DOTs, MPOs, and other stakeholders together, collaborative discussions can lead to changes in priorities or programs that support one another's goals. The **National Capital Region Transportation Planning Board (National Capital TPB)**, in response to discussions about lackluster progress toward meeting its regional safety targets, is establishing a regional safety program that will be funded annually in the Unified Planning Work Program (UPWP) to develop and implement policies, programs, and projects to increase safety. This establishes a new role (and funding) to engage on safety improvements. The MPO noted that coordinated discussions to address performance targets were more beneficial than the target itself, as the discussions revealed challenges and prompted the MPO, their Board, and the State DOTs to act toward meeting the targets.[24]

Targets can highlight regional transportation needs and encourage local governments to adjust their project submissions. In many regions, local governments suggest projects for funding at the State or MPO level, often with diverse perspectives on needs. Coordination around establishing targets can help highlight common goals and needs and lead to changes in locally identified priorities. The **Baltimore Regional Transportation Board** has seen an increasing awareness of regional transportation safety among member agencies after coordination with the Maryland DOT and other partners to establish targets for safety. Member agencies have shifted

projects from those focused on economic development and congestion to those with a safety focus, without the use of other incentives or requirements to encourage the shift.[25]

PBPP Can Break Down Silos

PBPP can prompt agencies to improve work across functional groups. For example, the **Wisconsin DOT** takes an interagency coordination approach to overcome challenges within their agency to ensure PBPP. The State DOT hosts monthly meetings with representatives from different modes across the agency and FHWA representatives. The FHWA Division and Federal Transit Administration (FTA) Region survey responses described how PBPP has encouraged the Wisconsin DOT to work across siloes; the monthly meetings help agencies "envision how all of the pieces fit together."[26]

Transit asset management plans[22] provide an opportunity for MPOs or the State DOTs to work with public transit providers on addressing transit needs. In long-range plans, coordination with public transit providers was often mentioned in the context of transit asset management plans.

- The **Tennessee DOT** sponsored a Group Transit Asset Management Plan for the 11 rural transit providers in Tennessee, which involved "significant cooperation" in collecting data, assessing conditions, and prioritizing investments.
- In Florida, TPM requirements for coordination "are beginning to have a positive effect on the coordination of plans between the MPOs and transit providers." According to the FHWA Florida Division, previously, MPOs had struggled to get Transit Development Plans from public transit providers; the requirements improved interagency coordination.[27]

Sharing system condition information among agencies can help identify areas with overlapping needs and address multiple projects together. The **Rhode Island DOT** uses performance data to stage efforts in a strategic order. The Rhode Island DOT has been developing a geospatial-based tool that will allow them to manage project intake by refining their bundling process. Planners realized that there were opportunities to bundle projects together; for example, it would be more efficient to complete an intersection improvement and resurfacing improvements at the same time. Recently, the Rhode Island DOT implemented this strategy and brought multiple asset owners together to coordinate Route 140 corridor improvements and pavement upgrades.[28]

[22] See 49 CFR 625.25.

Increasing Agencies' Understanding of What Works

Once agencies identify performance areas in need of improvements, the next step is to determine what types of strategies will be successful in addressing those needs. Not all strategies can be quantitatively evaluated to predict specific impacts to performance targets; however, they can at least be assessed qualitatively to help agencies focus on strategies that will best improve the state of the transportation system.

FHWA TPM Implementation Plan Description

- "This is a critical role for FHWA: What investment strategies are useful in achieving the targets set and the desired outcomes?"
- "While we have some knowledge today through our existing data tools, the TPM process provides us with an opportunity to develop that knowledge base even further with our partners."

(FHWA TPM Implementation Plan, page 2)

As agencies work toward meeting their goals for their transportation system, there is an opportunity to share strategies that have been shown to help agencies meet their performance targets or help move the performance area in the desired direction. Because PBPP is an evolving practice, many agencies do not have data yet to inform before-and-after studies of the impacts related to strategies, and have not engaged in historical analysis to determine the impacts of investments. This section highlights examples of approaches and strategies uncovered in this study that have demonstrated the impacts on performance.

Information on current performance can point to investments that will make progress. FAST Planning, in Alaska, identified safety needs at intersections across the region. Equipped with this information, the MPO included a low-cost safety improvement and roundabout conversion program in its UPWP, which has resulted in an approximately 90 percent reduction in serious injuries and fatalities at targeted intersections.[29]

Agencies can collaborate to conduct historical analyses and before-and-after studies. The **Memphis Urban Area MPO**, in Tennessee, worked with Federal, State, and local stakeholders to better understand the Federal congestion measures. The MPO convened a working group of stakeholders to discuss the definition of the measures, data sources, and calculation methodology. They conducted a historical analysis of peak-hour excessive delay, which allowed stakeholders to compare the effects of recent large-scale projects on this metric.[30]

Agencies also are modeling the anticipated impacts of projects or investment packages. The **Community Planning Association of Southwest Idaho's (COMPASS)** TIP for the Boise, Idaho region includes a table, Analysis of Safety Projects in the FY2020–2026 TIP, which identifies each safety-focused project in the TIP, the specific safety improvement, and the expected change in crashes.[31] The expected performance outcomes for each of these projects are likely influenced by a variety of factors related to the context of each project; however, COMPASS can use this data to look at trends related to categories of safety projects, which could help inform future projects.

Scenario planning can help facilitate discussions about funding decisions with the public and assess what strategies work. Scenario planning helps members of the public understand funding limitations and the impacts of their decisions in a way that helps participants determine choices that

would best meet their priorities for the future given current constraints. **The Fairbanks Area Surface Transportation Planning (FAST Planning)** conducted several scenario planning exercises as part of their long-range planning process. The process was highly transparent, which was well received by the public.[32]

Communicating the Return on Investment

Performance measures can show the needs of the system, compare the expense of improvements with available funding, and demonstrate anticipated improvements linked to various funding levels. Performance measures also can demonstrate the outcomes of different funding levels by transportation category and help the public and decision-makers decide where to invest available funds.

Performance measures can help agencies communicate needs and make a case for a priority or investment strategy. Performance data can clearly illustrate system deficiencies or needs to decision-makers and stakeholders. Many agencies explained that performance data have improved communications with Board members and other stakeholders, or helped them gain funding for investments.

- The **San Diego Association of Governments (SANDAG)**, in San Diego, California, found that asset performance data helped identify asset classes that were not doing well and helped educate the Board on some of the financing issues for transit.[33]
- Based on asset management performance data, the **Washington State DOT** determined that they have less than half the funds required to maintain their facilities in a state of good repair. New transportation revenues approved by the legislature in the past are heavily weighted toward mobility and economic vitality investments. The Washington State DOT is working on informing these decisions by sharing with their local and regional partners which roads (roads less than 45 miles per hour) and ramps they will no longer be able to preserve.[34]

FHWA TPM Implementation Plan Description

- "Without a common set of metrics and national reporting, we are challenged today in being able to effectively report on the outcomes of transportation investments and the impact of the $40B annual Federal investment on our Nation's highways."
- "The story we need to tell is not only what we are able to do but also what we are unable to do with existing resource constraints. This will inform discussions on future authorizations and Federal funding levels."
- "We should engage the public and decision-makers to ensure that we understand their needs and interests. The tools, messages, and reporting should meet both technical and non-technical audiences where they are. This might include a range of educational, informational, and analytical efforts."

(FHWA TPM Implementation Plan, page 2)

Performance-based approaches can improve transparency in the transportation planning and programming process, and support accountability.

- In 2014, the Virginia legislature adopted House Bill 2, which established a performance-driven planning and funding process for what eventually became known as SMART SCALE, which stands for System Management and Allocation of Resources for Transportation, a process that evaluates project metrics using key performance measures addressing improvements to Safety, Congestion mitigation, Accessibility, Land use coordination, and Economic development and environmental quality. Prior to this legislative priority, transportation projects that were implemented often lacked regional or local stakeholder support and had challenges moving forward. The **Virginia Office of Intermodal Planning and Investment (OIPI)** worked collaboratively with the Virginia DOT and Department of Rail and Public Transportation, and local and regional governments to develop the scoring system used to rank projects, leading to greater consistency, accountability, and public confidence regarding the selection of projects. Virginia OIPI is currently conducting work to identify methods to assess the impacts of projects funded under SMART SCALE to determine whether the anticipated benefits have been achieved.
- The **Des Moines Area MPO**, in Iowa, shares projects included in the TIP/MTP on a publicly available interactive map. Each project has a published score on its ability to address Federal and regional performance measures. These maps serve as a tool to help hold policymakers accountable; the public can directly see the existing conditions and hold policymakers accountable for focusing on key priorities.[35]

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[25] Interview with the Baltimore Metropolitan Council. August 24, 2020.
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[28] Peer Exchange: Focus on MPOs serving a population over 1 million. August 12, 2020.
[29] Peer Exchange: Focus on MPOs serving a population under 200,000. August 25, 2020.
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[31] Community Planning Association of Southwest Idaho FY 2020–2026 Regional Transportation Improvement Program. 2019. https://www.compassidaho.org/prodserv/transimprovement.htm
[32] Peer Exchange: Focus on MPOs serving a population under 200,000. August 25, 2020.
[33] Peer Exchange: Focus on MPOs serving a population over 1 million. August 12, 2020.
[34] Peer Exchange: Focus on State Departments of Transportation with plans from 2018–2020. August 24, 2020.
[35] Peer Exchange: Focus on MPOs serving a population between 200,000 and 1 million. August 25, 2020.

Chapter 2. Current Practices in Applying PBPP

Through all the lines of research and at agencies of every type and size, the research team found that performance-based planning and programming (PBPP) practices are continually evolving. This chapter presents findings about PBPP practices being utilized by agencies that practitioners may choose to apply to enhance their existing practices. The noted strategies have been effective at influencing decisions within four aspects of the planning and programming processes:

- Improving Coordination and Communications
- Enhancing Long-Range Planning
- Enhancing Programming
- Maximizing Planning Work Programs

Improving Coordination and Communications

Agencies describe coordination as a means to facilitate PBPP, while also describing PBPP as a means to facilitate coordination. The State departments of transportation (DOTs) and the metropolitan planning organizations (MPOs) are required to coordinate their planning processes with one another and other transportation agencies, such as public transit providers.[23] Performance-based approaches often help to enhance broader coordination among agencies and communications with stakeholders and the public, which benefits the transportation planning and decision-making process.

Performance-based approaches help develop and institutionalize relationships among agencies, which further reinforces effective performance-based approaches. Many agencies indicated that the PBPP process enhanced their coordination with other partner agencies. This section addresses four types of strategies that agencies can use to improve their coordination efforts:

- Using Federal Requirements as the Catalyst for Coordination
- Coordinating with Public Transportation Providers

Coordination when Establishing Targets for Federal Measures

"Each State shall select and establish performance targets in coordination with the relevant MPOs to ensure consistency to the maximum extent practicable … In areas not represented by an MPO, the selection of public transportation performance targets by a State shall be coordinated, to the maximum extent practicable, with providers of public transportation to ensure consistency with the performance targets that public transportation providers establish …"

23 CFR 450.206(c)(2) and (c)(3)

For MPOs, "[t]he selection of targets that address performance measures described in 23 [United States Code] U.S.C. 150(c) … shall be coordinated with the relevant State(s) to ensure consistency, to the maximum extent practicable…. The selection of performance targets described in 49 U.S.C. 5326(c) and 49 U.S.C. 5329(d) shall be coordinated, to the maximum extent practicable, with public transportation providers…."

23 CFR 450.306(d)

[23] 23 CFR 450.206(c) and 23 CFR 450.306(d).

- Formalizing Agreements for Coordination Among Agencies
- Communicating Performance with Stakeholders and the Public

Using Federal Requirements as the Catalyst for Coordination

Many agencies began breaking down interagency siloes in response to the requirement to coordinate in establishing the Federal performance targets. These working groups and other forums for collaboration have often continued for additional purposes beyond establishing Federal performance targets. The State DOTs and MPOs have all taken roles in leading efforts to collaborate.

The State DOTs can play a leadership role in coordinating among agencies.

- The **Broward MPO** in Fort Lauderdale, Florida, noted that the **Florida DOT** leadership had been crucial in their MPO PBPP efforts. The Florida DOT took the lead on performance measures and put together consensus language and targets, which are reviewed on a yearly basis. Most of the MPOs across the State adopted the Florida DOT targets, which has helped all agencies work together to improve safety.[36]
- The **Oregon DOT** takes a direct approach to encourage coordination by hosting several meetings and workshops to enhance performance measure communication with MPOs. During the target establishment process, the Oregon DOT hosted a communications workshop to coordinate with MPOs. The Oregon DOT also shared data and its process with MPOs and helped MPOs decide whether to set their own targets or support the State targets.[37]
- The **Rhode Island DOT, the State Planning Council** (MPO), and the Rhode Island FHWA Division Office held biweekly lunch meetings to discuss Moving Ahead for Progress in the 21st Century Act (MAP-21), the Fixing America's Surface Transportation (FAST) Act, and regulations related to transportation performance management (TPM) and PBPP. The lunch meetings acted as peer-to-peer training, with agency staff taking turns reading different sections of the law or regulations, and teaching one another the requirements.[38]

Integration of Federal Goals, Objectives, Performance Measures, and Targets

The State "shall integrate into the statewide transportation planning process, directly or by reference, the goals, objectives, performance measures, and targets described in this section, in other State transportation plans and transportation processes, as well as any plans developed [under 49 U.S.C. chapter 53] by providers of public transportation … required as part of a performance-based program...."

23 CFR 450.206(c)(4)

An MPO "shall integrate in the metropolitan transportation planning process, directly or by reference, the goals, objectives, performance measures, and targets described in other State transportation plans and transportation processes, as well as any plans developed under 49 U.S.C. chapter 53 by providers of public transportation, required as part of a performance-based program."

23 CFR 450.306(d)(4)

MPOs also can take a lead role in organizing coordination efforts. Some of the MPOs have initiated interagency workgroups to support developing performance measures and identifying needs and strategies that are then incorporated into the performance-based planning process for local and State transportation agencies.

- The **Regional Transportation Commission of Washoe County (Washoe County RTC)** in Reno, Nevada, has an effective interagency working group, the Planning Executive Performance Working Group, which meets monthly to create and integrate performance measures. The working group convenes representatives from the **Nevada DOT**, Washoe County RTC, and other neighboring MPOs to consider existing infrastructure while identifying and addressing future transportation projects. As a result, performance-based planning for the Metropolitan Transportation Plan (MTP) for the Washoe County RTC incorporates input from other transportation agencies, and the planning process is more transparent and balanced for both internal and external stakeholders.[39]
- The **Metropolitan Council**, in Minnesota, established a committee consisting of local, State, and Federal partners. The committee focused on setting congestion management process (CMP) performance measures and discussing priorities and the desired regional outcomes. These discussions enhanced interagency communication and led to a "broader discussion of how the region should measure and think about mobility issues and helped to unite regional organizations toward an agreed-upon reliability vision for the future."[40]

Coordinating with Public Transit Providers

Public transit providers are important partners for improving the performance of the transportation system.

Coordination efforts may include ongoing participation in one another's planning processes and coordinated development of plans or programs. MPOs and the State DOTs can build strong partnering relationships with public transit providers by identifying shared priorities and then working together to achieve them. Participating in ongoing planning activities together helps to support a common direction and priorities.

- The **Mid-Ohio Regional Planning Commission (MORPC)** coordinates with the **Central Ohio Transit Authority (COTA)** in several ways.
  - The MPO supports the development of COTA's plans and incorporates the components of the final transit plans into MORPC plans.
  - The agencies meet regularly to coordinate on planning efforts. Both agencies participate on a Technical Advisory Committee, which meets 10 times per year, and quarterly transit coordination meetings.
  - MORPC supports COTA during corridor studies and other special projects. For example, the agencies meet weekly to discuss a high-capacity transit study.
  - COTA consults MORPC when making service adjustments.
  - MORPC helps bring relevant parties to the table for COTA projects. For example, a bus rapid transit route required coordination among COTA, the City of Columbus, and county engineers; MORPC initiated coordination early in the planning process.[41]
- The **California DOT (Caltrans)** Division of Rail and Mass Transportation maintains the Caltrans Rail and Mass Transportation Interagency Coordination Program. An Interagency Coordination

Liaison facilitates the sharing of noteworthy practices and transit information, development of transit research, and multimodal connectivity efforts. The liaison also helps stakeholders coordinate on efforts to increase transit ridership, reduce emissions, improve transit equity, and enhance transit and land use connections.[42]

- On the borders of North Dakota and Minnesota, the **Grand Forks-East Grand Forks MPO (The Forks MPO)** and the local transit operator, **Cities Area Transit**, collaborate with one another on the development of the MPO's Transportation Improvement Program (TIP), rather than creating separate programs of projects.[43]
- The **Wasatch Front Regional Council (WFRC)**, the MPO for the Salt Lake City region, works closely with the local public transit provider, the **Utah Transit Authority (UTA)**, and the **Utah DOT**. The agencies co-hosted many workshops to solicit public input for long-range planning. WFRC, UTA, and the Utah DOT also collaborate to engage environmental justice (EJ) populations through hosting community organization workshops, conducting education efforts, and developing visualization tools. In addition, the agencies collaborate on scenario analysis, environmental studies, and corridor plans.[44]
- The **San Diego Association of Governments (SANDAG)** collaborates with tribal organizations to improve the mobility of the 17 federally recognized tribes in San Diego County. SANDAG works with the **Southern California Tribal Chairmen's Association** and the **Reservation Transportation Authority**. SANDAG also has a tribal liaison in its Land Use and Transportation Planning Department. Efforts have included a Tribal Transit Needs Assessment, a Tribal Summit, an Interagency Technical Working Group on Tribal Transportation Issues, tribal transit feasibility studies, and tribal transportation demand management outreach.[45]

Sharing facilities and staff time can ease coordination efforts. The **Community Planning Association of Southwest Idaho (COMPASS)**, the MPO for the Boise, Idaho region, and its transit provider, **Valley Regional Transit**, share a building. COMPASS has a staff member who is dedicated to public transit and participates in Valley Regional Transit meetings. Valley Regional Transit hires staff with broader transportation experience, which makes multimodal planning and coordination easier. These public transit planners participate in the COMPASS development review checklist process and help make projects more transit-friendly.[46]

Transit asset management planning provides an opportunity for strengthening relationships and learning information that may influence the activities of the State DOTs or MPOs.

- **The State DOTs and MPOs are required to coordinate with public transit providers to set transit asset management targets.**[24] The **Coastal Region MPO** in the Savannah, Georgia region coordinates with the **Chatham Area Transit Authority** and the **Coastal Regional Commission** to set transit asset targets. The Chatham Area Transit Authority receives Federal Transit Administration (FTA) funds and develops its own Transit Asset Management (TAM) plans, and the Coastal Regional Commission participates in the **Georgia DOT** group TAM plan.[47]
- The **Washington State DOT** developed a Transit Asset Management Guidebook, which has enhanced coordination with MPOs and public transit providers.[48] The DOT also has Public Transportation Coordination Liaisons and "welcome[s] transit agencies to the table" during discussions about performance measures, targets, and investments.[49]

[24] 23 CFR 450.206(c)(3) and 23 CFR 450.306(d)(2)(iii).

- The **Southeastern Wisconsin Regional Planning Commission (RPC)**, the MPO for the Milwaukee, Wisconsin region, prepared a Group Transit Asset Management Plan for transit operators in the region. The MPO collected asset information from the eight Tier II operators and held individual meetings to prepare the plan.[50]
- The **Tennessee DOT** sponsored a Group Transit Asset Management Plan for Tennessee's 11 rural transit providers. "The plan necessitated significant cooperation between [the Tennessee DOT] and the transit providers in data collection, condition assessment, needs estimation, and investment prioritization."[51]

Public transit providers are key participants when transportation agencies seek to build a coalition of support for coordinating land use and transportation planning, which is a key goal and strategy in many long-range transportation plans.

- The **Rhode Island DOT's Division of Planning** has a comprehensive, cross-sector land use plan that includes many transportation-specific policies, including promoting high-density housing and employment near major transit routes, locating development within transportation corridors, and applying land use design standards in transportation corridors.[52]
- **WFRC** hosts a Transportation and Land Use Connection program in partnership with UTA, Salt Lake County, and the Utah DOT, which helps local communities plan for growth.[53]
- **SANDAG** works with transit providers and other local agencies to address the regional challenges stemming from imbalances of jobs and housing growth. This collaboration is coordinated through the I–15 Interregional Partnership, which consists of SANDAG, the Riverside County Transportation Commission, **Riverside Transit Agency**, California Transportation Commission, Western Riverside Council of Governments, and Caltrans. The partnership is a voluntary compact that is funded through State grants. The partnership has led to joint efforts, such as a coordinated study to assess transportation issues and identify solutions along one section of I–15.[54]

Formalizing Agreements for Coordination Among Agencies

Agencies have long entered into formal agreements for coordination, which offer a means to clarify each agency's roles and responsibilities to the others. The process of developing the agreements can be used to strengthen relationships that may have previously been informal. The agreement's specifics will often help the agencies avoid redundant efforts and know when and how to include one another in activities, such as data collection and analysis. In recognition of the value of writing down these agreements, Federal regulations include requirements to do so as part of the planning process.[25]

Metropolitan Planning Agreements

"The MPO, the State(s), and the providers of public transportation shall cooperatively determine their mutual responsibilities in carrying out the metropolitan transportation planning process. These responsibilities shall be clearly identified in written agreements among the MPO, the State(s), and the providers of public transportation serving the MPA …"

23 CFR 450.314(a)

(with detailed requirements in (b)-(h))

[25] See, e.g., 23 CFR 450.314.

Formal agreements can be especially useful when coordinating efforts among many agencies or performance areas.

- The **Metropolitan Area Planning Forum** is a group of nine MPOs in New York, New Jersey, Connecticut, and Pennsylvania that formed a consortium to coordinate planning activities, achieve consistency in planning products and tools, and share data and forecasting information. The member MPOs signed a memorandum of understanding based on voluntary coordination and cooperation regarding transportation planning documents and efforts to meet National Ambient Air Quality Standards. The Forum holds an annual meeting with MPO executive directors. Public transit providers, the State DOTs, and the Port Authority of New York and New Jersey also are encouraged to attend this meeting, which focuses on the development of federally-required planning products.[55]
- **SANDAG** has entered into data sharing and target establishment coordination agreements with **Caltrans, the San Diego Metropolitan Transit System, and the North County Transit District**. SANDAG and Caltrans also have signed agreements to use certain datasets when establishing targets and to coordinate on meeting PBPP requirements.[56]
- The **Massachusetts DOT** works with the **Massachusetts Bay Transportation Authority** and the State's 15 Regional Transit Authority partners to incorporate transit performance measures into Transit Asset Management Plans. In 2019, the Massachusetts DOT established a PBPP agreement, along with MPO and Regional Transit Authority representatives, regarding PBPP responsibilities. The agreement establishes mutual responsibilities in "developing and sharing performance management data, selection of performance targets, reporting of performance targets, and progress toward achieving targets."[57]

Communicating Performance with Stakeholders and the Public

The sharing and reporting of data for performance-based planning processes provide opportunities for enhancing coordination and communications with stakeholders and the public. Strengthening communication channels with stakeholders and the public can reinforce the support of transportation agency goals, objectives, and targets. **SANDAG**, in San Diego, California, used performance data not only to identify transit assets that were not doing well, but also to educate the Board about issues related to financing transit service.[58]

Communicating transportation system performance can take different forms, including static performance reports, interactive options such as public presentations and workshops, and online tools and dashboards.

Providing Static Performance Reports

Static performance reports, whether a stand-alone report or integrated within planning and programming documents, tend to report on current conditions and how those conditions are tracking against longer term goals or targets.

Most of the State DOTs and MPOs publish a report of current performance, whether as a stand-alone report (24 percent of the State DOTs and 20 percent of the MPOs, based on the online scan conducted for the research), a chapter in a long-range plan (18 percent of the State DOTs and 42 percent of the MPOs), or in another manner, such as a chapter in the statewide transportation improvement program (STIP)/TIP or included as part of another chapter in the long-range plan.

Federal regulation now requires that the State DOTs and MPOs include a system performance report as part of the long-range statewide transportation plan (LRSTP) and MTP.[26]

- The **Baltimore Metropolitan Council** includes a system performance report as a section in their MTP. This report clearly lists each of the federally-required performance measures, tracking data from previous years, and targets going forward.[59]
- The **Illinois DOT** publishes a system performance report as an appendix to its LRSTP. The report describes each Federal performance measure; the methodology for analysis and details on selected or proposed targets; and charts illustrating past data, trendlines, and targets.[60]
- The **Madison Area Transportation Planning Board**, in Wisconsin, tracks and reports both Federal and non-Federal performance measures through the MPO's Performance Measures Report (2016). The report is organized by approximately 7 goals and 25 related measures. The Performance Measures Report provides trend data for each performance measure. Measures include an Active Living Index, housing and transportation costs, transit access to jobs, the percentage of key destinations served by transit, roadway congestion and reliability, vehicle-miles traveled (VMT), mode of transportation to work, nonmotorized and motorized serious injuries and fatalities, air quality, and pavement and bridge conditions.[61]
- The **Wasatch Front Regional Council**, in Utah, published a MTP that includes a system performance report, listing each of the federally-required performance measures and State targets as a standalone chart, along with a detailed section of regionally developed performance measures. The section on regional performance measures also includes a comparison of projected trends under a no-build scenario compared with the investments in the MTP.[62]

Providing Online Data Tools and Dashboards

At the time of our review, approximately 15 percent of both the State DOTs and MPOs maintained an online dashboard for reporting system performance.

- The **Hawaii DOT** has used a data dashboard to proactively communicate to the public data about safety, infrastructure conditions, and project status.[63]
- The **Boston Region MPO** has a dashboard that contains demographic information and data on their transportation equity efforts.[64]
- The **New York Metropolitan Transportation Council** has created TPM dashboards for both the Federal performance measures and their own. These dashboards communicate regularly updated data on key performance measures. The dashboards have served as effective tools for conveying complex data in an accessible format to stakeholders and the public.[65]
- The **Metropolitan Transportation Commission**, in the San Francisco Bay Area, has a dashboard called Vital Signs that helps the public and local decision-makers see how performance in the region is changing over time. The performance measures used relate to transportation, land and people, the economy, the environment, and equity.[66]

Other online tools provide interactive data analysis options to support planning partners' decision-making processes.

- The **Kentucky Transportation Cabinet (KYTC)** maintains a publicly available database called DataMart. Via the database, KYTC's planning partners can analyze a wide range of datasets to

[26] 23 CFR 450.216(f)(2) and 23 CFR 450.324(f)(4).

answer questions about needs and opportunities. KYTC updates DataMart regularly as new information is gathered.[67]

- The **Texas DOT** uses a cloud-based performance evaluation tool, the Performance Metrics: Data Integration System (PM-DIS), to help evaluate deficiencies and keep project data up-to-date and accurate. The Texas DOT districts and MPOs can enter project data into the PM-DIS. They have the option of running an assessment of their priority projects and ranking them for the Unified Transportation Plan. The tool provides project sponsors with the ability to evaluate projects, as well as the flexibility to adjust as necessary. According to the Texas DOT, prior to utilizing this tool data were evaluated inconsistently, which made it difficult to prioritize projects effectively. Now the tool has prompted districts and MPOs to improve their data management to ensure accuracy at the State level.[68]

Using Data to Make Stakeholder and Public Engagement More Meaningful

Mapping tools and other online engagement methods are becoming more common and provide an opportunity for both stakeholders and members of the public to learn more details about transportation performance than they could have previously.

- The **North Central Texas Council of Governments (COG)**, the MPO for the Dallas/Fort Worth, Texas region, has several interactive online tools related to the TIP and MTP, including interactive maps that show the Mobility 2045 recommendations and several topic-specific interactive maps such as an EJ index map displaying regional demographics, a transit accessibility improvement tool that identifies communities with transportation disadvantages, and a travel-time contour map. The MPO has a mapping tool that the public can use to suggest new projects. All comments are visible on the online map.
- **Virginia Office of Intermodal Planning and Investment's (OIPI)** SMART SCALE website informs stakeholders, educates the public, and communicates the overall process and results for SMART SCALE, which stands for System Management and Allocation of Resources for Transportation, a process that evaluates project metrics using key performance measures addressing improvements to Safety, Congestion mitigation, Accessibility, Land use coordination, and economic development and environmental quality. The website "includes training videos, [a] link to the SMART Portal, project scorecards, raw scoring calculations, access to all application details, and interactive mapping." The SMART SCALE dashboard allows decision-makers and the public to monitor the implementation of projects funded through SMART SCALE.

Enhancing Long-Range Planning

Transportation agencies employ a variety of performance-based strategies and activities in long-range planning. Each agency has different roles and responsibilities regarding transportation planning and decision-making; however, many of the strategies described here can be adapted to multiple long-range planning approaches. For example, many MPOs may not have a role in selecting projects for their plans; however, they can use performance data and analyses to facilitate discussions with their planning partners and member agencies about regional needs and priorities, and help guide project submissions or prioritization for the MTP.

The State DOTs also may need to adapt the strategies depending on whether they are working on an LRSTP or a 10-year plan. The LRSTPs often do not include projects, instead focusing on setting the agency's policy direction for the 20-year planning horizon. Rather than including projects in the

LRSTPs, many of the State DOTs instead use 10-year strategic plans to guide the investments and project lists that lead to the STIPs. At those State DOTs, the LRSTPs set long-range visions and goals, and the 10-year plans select objectives and projects that will help the agency make progress toward those long-term goals.

This report organizes the long-range planning strategies into six categories:

1. Selecting Meaningful Performance Measures and Targets
2. Influence of Current Conditions and Performance on the Long-Range Plan
3. Influence of Other Plans on the Long-Range Plan
4. Understanding and Communicating Impacts: Forecasting and Scenario Planning
5. Developing Policies, Programs, and Investment Priorities
6. Strategies and Investments Selected to Improve Performance

Selecting Meaningful Performance Measures and Targets

In addition to the federally-required measures,[27] many agencies develop their own performance measures to guide long-range planning decisions. Many agencies began using a performance-based planning approach prior to Federal regulations for PBPP and may continue to use some or all of these measures in their practice. In addition, the federally-required measures[28] do not address all of the priority areas within a State or region, and agencies have developed their own measures for these priority areas, such as equity, active transportation, climate change, and others.

Developing performance measures in relation to State and regional goals can help ensure that the agencies are representing the interests of their stakeholders and communities. The online scan of all State DOTs and a sample of 85 MPOs revealed that many LRSTPs and MTPs contained performance measures that address issues beyond those required under the Federal TPM regulations.[29] Accessibility, economic development, social equity, and resiliency were the most used non-required measures. However, the data and methodology for measuring performance in these areas vary among agencies.

Agencies often develop objectives and performance measures associated with their goals, and even set targets, to help support the measurement of progress toward those goals. Unlike the short-term (generally 2- and 4-year) targets required for the Federal TPM

Performance Measure Categories

Appendix D provides examples of performance measures in the following performance areas:

- Accessibility
- Active Transportation
- Congestion and Reliability
- Environmental Sustainability and Resiliency
- Equity and Health
- Finance
- Freight
- Land Use Linkages
- Public Engagement and Satisfaction
- Safety and Security
- Transit

[27] See 23 CFR Part 490.
[28] See 23 CFR Part 490.
[29] See 23 CFR Parts 450, 490; 49 CFR Parts 613, 625, and 673, as further described in the Introduction of this report.

measures, agencies often set long-range or interim targets to align with the timeframe of the long-range transportation plans. In addition, agencies have begun including the Federal measures under their goals and reporting on near-term targets in their plans.

- The **Kentuckiana Regional Planning and Development Agency (KIPDA)**, the MPO for the Louisville, Kentucky region, identified 10 key goals in its Performance Management Plan, which is considered part of the MTP. Under each goal, KIPDA established several quantitative targets, some of which are based on national performance measures under Federal requirements and some of which are specific to the region. One goal is to increase the availability and efficiency of person-based multimodal options. Three quantitative targets fall under this goal:
  - » Increase systemwide transit ridership by 20 percent by 2040.
  - » Reduce by 20 percent the identified gaps in pedestrian walkways along functionally classified roadways by 2040.
  - » Reduce by 20 percent the identified gaps in bikeways along functionally classified roadways by 2040.
- **MORPC**, in the Columbus, Ohio region, also developed a tiered system with six long-range goals, accompanying objectives, and two to four quantitative targets for each objective for the years 2020 and 2040. The goals address topics including reduce per capita energy consumption and promote alternative fuels; protect natural resources and mitigate infrastructure vulnerabilities; position Central Ohio to attract and retain economic opportunity; create sustainable neighborhoods to improve residents' quality of life; increase regional collaboration and employ innovative transportation solutions to maximize the return on public expenditures; and use public investments to benefit the health, safety, and welfare of people.[69]
  - » Objectives under the goal "create sustainable neighborhoods to improve residents' quality of life" include:
    - – "Encourage and support member communities to adopt complete street policies or policies that contain those elements."
    - – "Target infrastructure development to serve a higher number of people and jobs, and increase sidewalk coverage of arterials and collectors."
    - – "Target transit and bikeway infrastructure development to serve a higher number of people."
  - » Targets include 45 percent of member communities adopting complete street policies by 2020 and 100 percent by 2040.
  - » The MTP also describes strategies for meeting each objective, which its stakeholders often use as a guide for identifying what types of projects to invest in.[70]
- The **Pikes Peak Area COG** in Colorado Springs, Colorado, established 13 goals with associated performance measures as part of its MTP, building on extensive public engagement and stakeholder input. Stakeholders, residents, and staff set broader goals and objectives through a multi-stage process. Examples of goals and performance measures include:
  - » Goal: Improve system connectivity within and between modes and accessibility for everyone.

  - Performance measures: Nonmotorized system connectivity and accessibility index, percentage of transit ridership increasing annually over a 5-year moving average, total number of revenue service-miles for transit passenger service

» Goal: Increase the resiliency and redundancy of the transportation system.

  - Performance measures: Percentage of assets at high risk without viable alternative(s).[71]

Agencies set measures and targets beyond the Federal requirements for a variety of performance areas. Agencies also measure performance in areas such as active transportation, land use linkages, and security. Appendix D includes a more detailed list of performance measures and targets beyond the Federal requirements.

- **SANDAG** uses many accessibility measures, such as the percentage of work trips accessible within 30 minutes during peak periods by transit for low-income communities and minority communities.[72]
- The **Missouri DOT** sets several quantifiable customer satisfaction targets, such as the percentage of customers who trust the agency to keep its commitments.[73]
- The **Rhode Island State Planning Council's** environmental sustainability measures include percentage of commuters driving alone, gallons of gasoline purchased, and greenhouse gas (GHG) emissions.[74]

Influence of Current Conditions and Performance on the Long-Range Plan

Information on existing system conditions and performance provides context to identify needs and priorities. The information on conditions and performance can be helpful to identify challenges to address and can serve as a baseline for forecasting anticipated changes in performance. This information can be helpful in all types of plans. For agencies with long-range plans that include project lists, the data on existing and forecasted future conditions and performance can be used by partners when identifying project concepts to submit for the long-range plan. This strategy can be used by all agencies to coordinate priorities with planning partners and influence project selection in the long-range plan, especially among MPOs or agencies with a limited role in long-range plan project selection. For State DOTs that do not include projects in the LRSTP, but instead focus on setting the agency's policy direction for the 20-year planning horizon, information on conditions and performance provides a foundation for describing what the transportation system is intending to achieve. Analyses of the data can help to support identification of needs and improvement strategies.

- The **Memphis Urban Area MPO**, in Tennessee, conducts analyses on several topics, including a transit gap analysis to identify new opportunities to improve transit access for EJ communities, a mobility/livability corridor assessment, and a bicyclist and pedestrian mobility assessment.[75]
- The **Connecticut DOT** conducted "micro simulations" for highly congested areas to determine the factors that caused congestion (e.g., short ramp lengths, high traffic to train stations). The study allowed the agency to implement "manageable and cost-effective solutions to the corridor where adding additional lanes would be cost prohibitive."[76]
- **PennDOT** (the Pennsylvania DOT) used MetroQuest, which let users review the background on plans, rank program areas, review and evaluate investment scenarios, and comment on an

interactive map. The interactive map received comments on nearly 7,000 locations; these comments were shared with the respective planning partners.

In addition, some agencies use system condition as **an input to project selection.** Consideration of system condition in project selection is a direct way to influence the project list in a long-range plan.

- **Virginia OIPI** evaluates current conditions using a SMART SCALE process, which helps to address capacity and safety needs. VTrans (Virginia's multimodal LRSTP) establishes the needs, SMART SCALE implements solutions for those needs, the SMART SCALE program team assesses the impacts of those investments on performance, and the results inform the next VTrans needs assessment and refinement of the SMART SCALE evaluation criteria. There have been many direct and indirect benefits of this continuous refinement of the needs assessment and the evaluation criteria: applications for SMART SCALE projects are better prepared, leaner, and more focused on solving specific problems.[77]
- The **Des Moines Area MPO**, in Iowa, noted that they focus on creating a transparent, simple scoring system. They use the Federal measures, as well as additional measures such as EJ-related measures. The rating system rewards more points to projects on bridges or roads with poor levels of service. The MPO displays bridge conditions, EJ populations, and more on interactive online maps. These maps serve as a tool to help hold policymakers accountable; the public can directly see the existing conditions and hold policymakers accountable to focusing on key priorities.[78]
- The **Hillsborough MPO**, the MPO for the Tampa, Florida region, used performance data to prioritize safety projects in high-need areas. The agency combined more than 10 years of previous crash data and forecasting model outputs to identify crash hotspots. Then, the MPO used Crash Modification Factor scores to evaluate the effectiveness of certain safety treatments and bundled the most impactful treatments together for implementation in the highest risk corridors.[79]

Influence of Other Plans on the Long-Range Plan

As mentioned previously, many agencies are developing performance-based plans for the first time and are beginning to incorporate the content from these plans in their long-range plans. Agencies are beginning to use findings and data from the earliest developed performance-based plans to inform their long-range plans. Most long-range plans that incorporate these other performance-based plans currently incorporate the plans or their measures and targets by reference. A few long-range plans have started to have their project lists change because of the influence of the other performance-based plans.

Several agencies used those plans' project lists directly as the lists for their long-range plans or, in the case of State DOTs, 10-year strategic plans**.**

- The **Kentucky Transportation Cabinet (KYTC)** uses the projects identified in its other performance-based plans (e.g., freight plan, asset management, safety) to develop the lists of projects that it adopts for the different modal components of its 10-year Highway Plan. In future years, KYTC hopes to develop methods for assessing tradeoffs and co-benefits that may occur among the projects that come out of different plans.[80]
- State DOTs (**Idaho Transportation Department [ITD]** and **District DOT**) and MPOs (**Mountainland Association of Governments** and **Wasatch Front Regional Council** in the Salt

Lake City, Utah area) have used the State freight plan as the source for the freight project list of their long-range plans.[81, 82, 83, 84]

Some agencies evaluate and compare projects listed in other performance-based plans with the priorities of the long-range plan to inform the final list of projects.

- The **Baltimore Regional Transportation Board (BRTB)**, in Maryland, uses various performance-based plans to "get the best projects to the table" and then evaluate and compare them. The MPO is currently considering changes in its use of performance-based plans; currently, safety evaluation is limited, and in the next plan, they aim to take a stronger look at incorporating accessibility measures.[85]
- **The Baltimore region's** CMP studied effective methods for congestion management. It examined corridors where projects are recently or nearly completed and compared congestion before and after. CMP strategies are linked to the MTP submittal form and influence weighting in the project selection process.[86]

Understanding and Communicating Impacts: Forecasting and Scenario Planning

Agencies are beginning to develop methods for understanding how their long-range plan investments are expected to improve performance. Many agencies currently use models to forecast pavement and bridge condition and future travel demand and travel patterns.

These forecasting tools and less sophisticated options are often combined in scenario planning approaches to assess the tradeoffs of various investment scenarios, which may lead to shifts in the long-range plans' project lists. Scenario planning and some forecasting analyses also help agencies envision potential needs based on one or more potential future scenarios. These future scenarios forecast conditions based on potential demographic, economic, cultural, or other types of changes, such as increased remote work or widespread adoption of automated vehicles. Future transportation needs and investments may differ based on each scenario.

Over the past few years, many of the MPOs reviewed in the online scan for this study have generated forecasts of system performance related to the federally-required performance measures; however, these typically rely on regression analyses of historic trends, and do not necessarily take into account the impacts of proposed investments.

Pavement and Bridge Condition Forecasting

Some agencies, primarily the State DOTs, use forecasting tools to analyze anticipated bridge and pavement conditions over time and in relation to investments. These tools can help agencies develop strategies or policies for prioritizing maintenance. The **Colorado DOT** has an Asset Investment Management System, which helps asset managers assess the relationship between funding and performance. Based on forecasted conditions, the system shows the tradeoffs among asset funding scenarios, including pavement and bridge conditions.[87]

Travel Demand Forecasting

For decades, MPOs have used travel demand models to develop system performance forecasts and to test the effectiveness of proposed major investments on congestion indicators (e.g., levels of

service based on measures such as VMT, vehicle-hours traveled, vehicle-to-capacity ratio) and accessibility indicators (e.g., number of jobs accessible within 30 minutes).

While the complexity and scope of forecasts vary, it is typical to run travel demand model forecasts for three scenarios: present day, a future date with projects that are already existing or committed (E+C) to by that date, and a scenario with long-range projects added to the E+C projects.

- The **Memphis Urban Area MPO's** process represents a typical forecasting method: The MPO forecasts employment, household, and population growth and density for each decade up to 2050. A travel demand model accounts for this anticipated growth and forecasts 2050 congestion levels with just the "existing and committed" projects. This forecast sets a baseline for comparing future investment scenarios.[88]
- Federal performance measures helped the **Delaware Valley Regional Planning Commission (DVRPC)** identify the most cost-effective strategies for congestion management in the Philadelphia region. DVRPC used a travel demand model to estimate the impact of operational improvements and system expansions on hours of delay. The model showed that operational improvements reduced congestion more cost-effectively, so DVRPC shifted to prioritizing operational improvements in the MTP.[89]
- Similarly, **SANDAG** forecasts performance measures for existing, no-build, and revenue-constrained scenarios for the San Diego region. For each of these scenarios, the MPO predicts the outcomes on a number of performance measures, including healthy environment measures (e.g., transit passenger-miles per capita), social equity measures (e.g., mode share for low-income and minority populations, distribution of MTP expenditures per capita), and mobility measures (e.g., out-of-pocket user costs per trip).[90]

Scenario Planning

Scenario planning is a more sophisticated analysis than forecasting. While forecasting compares outcomes of future conditions with and without the planned projects or investments, scenario planning outlines multiple future scenarios depending on external trends such as climate change, land use patterns, or changing demographics or economies. Scenario planning can be used to focus on multiple areas to understand tradeoffs of investments amid multiple future scenarios.

Scenarios control for and consider a variety of factors, including funding levels, land use, and investment strategies. Some scenarios are intended to build an understanding of what the region will look like in the future, others help educate stakeholders about the tradeoffs of different investments, and yet others explain the outcomes of different levels of funding.

Scenario planning as it relates to PBPP is only conducted at a small number of transportation agencies to date. This level of analysis indicates a mature PBPP process and is expected to be undertaken by more agencies as they develop their PBPP approaches.

Land use scenarios explore how different patterns of future land use development will impact the transportation system.

- The **Michiana Area COG**, the MPO for the South Bend, Indiana region, uses a hybrid travel demand forecasting model that uses aspects of activity-based models and four-step models. The Michiana Area COG conducted a no-build scenario model run, as well as a high-growth scenario, low-growth scenario, and urban growth development pattern run. This scenario analysis was not

used to select one preferred growth model; it was used to inform policy questions and project prioritization. The scenarios identified areas of the transportation network that would perform at unacceptable levels of service.[91]

- For **COMPASS**, the MPO for the Boise, Idaho region, scenario planning has helped focus on identifying strategies that will improve performance, rather than simply tracking performance. COMPASS conducted public stakeholder meetings with approximately 175 participants for the recent transportation plan update. In a charrette style workshop, participants were divided into groups that focused on eight goal areas, including traffic congestion and farmland preservation. The MPO used the software Community Viz, which enabled participants to provide real-time responses to growth allocations. The indicators and scenarios examined impacted the goals and methodologies used in the development of the MTP.[92]
- The **Chittenden County RPC,** the MPO for the Burlington, Vermont area, analyzes nine transportation and land use scenarios, including a base scenario, various connected and autonomous vehicle use scenarios, and land use density scenarios. The Chittenden County RPC examines the effect of each scenario on congestion and delay, VMT, total number of vehicle trips, and mode share. The Chittenden County RPC also estimated greenhouse gas (GHG) emissions for the 2050 base and 2050 MTP scenarios using the United States Environmental Protection Agency's Motor Vehicle Emission Simulator (MOVES).[93]
- The **Pima Association of Governments (PAG)**, in Tucson, Arizona, developed land use and development scenarios that held population and job growth equal across three scenarios with varying distribution and density of the population and jobs: (1) mostly suburban, (2) mixed urban and suburban, and (3) mostly urban. PAG used the regional travel demand model to compare how each scenario would perform under the Regional Transportation Plan (RTP) and without the RTP (a no-build scenario). Next, PAG considered four RTP investment options and analyzed how the options interacted with the land use scenarios. Each of the investment options focused on a different set of goals and performance outcomes, such as an option that placed greater emphasis on repairing and maintaining roads and one that emphasized active transportation and transit. Combining the land use scenarios and investment options, PAG conducted 15 different model runs that analyzed the effects on performance measures such as VMT, mode share, and transit trips.

Uncertain futures scenarios explore how the transportation system will perform in future, uncertain external conditions. **DVRPC's** MTP used scenario planning to understand the impacts of external factors over time. DVRPC formed the Greater Philadelphia Futures Group, a group of experts that helped identify future external trends. The experts identified "Future Forces" that may affect the region, including a "free agent economy," "severe climate," and "U.S. energy boom" scenarios. The MTP forecasts the effects of each scenario on key indicators by 2045. Indicators include demographic metrics, annual residential GHG emissions per household, percentage of zero-car households, and annual household transportation costs.[94]

Financial and investment scenarios can help agencies evaluate transportation system performance under various funding levels or distribution of funding among transportation projects or categories. These scenarios enable agencies to explore what they might accomplish if they had higher levels of funding than currently forecasted and how to optimize performance within limited funding.

- The **Metropolitan Area Planning Agency (MAPA)**, the MPO for the Omaha, Nebraska-Council Bluffs, Iowa region evaluated a set of different investment strategies for a system of priority

corridors. The strategies included traditional capacity improvements, technology improvements, transit investments, changes in intersections, and asset management. They built six initial scenarios around different types of investment strategies. This approach allowed them to demonstrate the performance of investment strategies to the public. It also allowed them to center the initial dialogue around performance rather than costs. Ultimately, they selected a more targeted geographic approach that focused more on transit in urban areas and arterial improvements elsewhere.[95]

- **Metro**, the MPO for the Portland, Oregon region, conducted three funding scenarios: a 2027 constrained-funding scenario, a 2040 constrained-funding scenario, and a 2040 strategic-funding scenario. The strategic funding scenario includes additional investments that Metro would make if new funding became available.[96]
- The **National Capital Region Transportation Planning Board (TPB)**, the MPO for the Washington, DC region, found that congestion, which was already among the most severe in the Nation, was forecasted to worsen in the MTP even with all of the investments in the plan. The MPO Board was dissatisfied with this and conducted a scenario planning exercise to test how major regional initiatives might have a greater impact. The Board then adopted some initiatives as aspirational elements in the MTP.[97]
- The **North Carolina DOT** evaluated 10 potential options for "closing the revenue gap," including a VMT fee, a local vehicle property tax, and elimination of transfers from the highway fund. The North Carolina DOT conducted four revenue scenarios: Interstate highway tolling to supplement existing taxes and fees, shifting from a motor fuel tax to a VMT fee, "enhancing existing revenue sources with indexing and increases," and "supplementing existing taxes/fees with new revenue sources other than Interstate highway tolling." The intention of the scenarios was to understand the benefits and disadvantages of each strategy, rather than selecting one specific strategy.[98]

Developing Policies, Programs, and Investment Priorities

Transportation agencies employ a range of methods for selecting projects for inclusion in their long-range plans and transportation improvement programs. These methods range from highly objective, data-driven prioritization processes to less structured processes driven largely by agency board members or other decision-makers.

To enhance PBPP effectiveness, agencies can move from passively tracking performance to actively investing in systems that will improve performance. Developing effective prioritization criteria for projects is challenging and requires thoughtful analysis to yield project selections that will advance State and local goals. Determining weights for individual project scores or conducting analysis of investment scenarios to identify the preferred mix of projects or investments will benefit from thoughtful planning and analysis.

Data on current conditions can be used for identifying needs and priorities to address, as discussed earlier in this chapter. By setting these priorities at the regional or State level, the agencies let their planning partners know what to aim for with their projects:

- The **Knoxville Regional Transportation Planning Organization**, in Tennessee, for example, conducts extensive crash analysis on bicyclist/pedestrian crashes across the region, categorized by geography, year, and type, which informs local and regional safety investment priorities.[99]
- The **Des Moines Area MPO**, in Iowa, uses performance data to evaluate their priorities of state of good repair and maintaining current assets. The metrics help the agency evaluate projects that are submitted and signal to agencies which projects to prioritize. Now, the MPO receives more project submissions for reconstruction rather than expansion.[100]

Transportation Equity Evaluation at Metro (the MPO for the Portland, Oregon region)

Metro coordinated with representatives from local groups and conducted public outreach to identify transportation issues prioritized by historically marginalized communities as they conducted a Transportation Equity Evaluation of the investment strategy in the 2018 RTP.

In the first round of analysis, Metro evaluated the performance of the RTP investment strategy and tested new transportation equity evaluation measures. The first round was followed by a call to action to the region to revise the investment strategy to enhance performance in equity, as well as climate resilience, congestion management, and providing travel options.

In the second round, Metro evaluated the investment strategy with the responses from the call to action. Metro also conducted a geographic information system (GIS) analysis of the proposed projects. This analysis showed which projects intersected with priority locations, including high-injury corridors, equity focus areas, and areas lacking facilities for nonmotorized transportation. Metro then recommended that local governments propose projects that fill in identified gaps.

Interview with Metro. August 6, 2020.

To identify the effective and meaningful criteria that planning partners will support, some agencies engage those partners in developing the criteria.

- In Central Oklahoma, representatives of local public transit providers (**Central Oklahoma Transportation and Parking Authority and the City of Norman Transit**) played a key role in developing the Surface Transportation Block Grant (STBG) program scoring criteria for the **Association of Central Oklahoma Governments (ACOG)**, the MPO for the greater Oklahoma City region. In 2018, the MPO policy committee convened a subcommittee to update STBG scoring criteria and included representatives from these local public transit providers and the Oklahoma DOT's Office of Mobility and Public Transit. Under these new criteria, transit projects were more competitive, and ACOG allocated more than $2 million in STBG Urbanized Area funds to public transit providers in 2021.[101]
- The **North Carolina DOT** has an ongoing collaborative process. See sidebar.

Many agencies have designed project selection or prioritization criteria to select projects for their long-range plans, which will improve performance. Agencies vary in their approaches, ranging from a highly detailed and technical scoring process with weighted measures to a more general qualitative checklist.

- **DVRPC**, the MPO for the Philadelphia, Pennsylvania region, lists the criteria it uses when considering major roadway and transit system preservation and operational improvement projects. These criteria include whether the project is located in a priority center, the impact on "high indicators of potential disadvantage" communities, and whether the project will deliver air quality benefits.[102]
- **Fairbanks Area Surface Transportation Planning's (FAST Planning)** MTP process also includes screening criteria with scores and weights, including measures for safety, connectivity, air quality, existence in current plan, land use, daily traffic, pavement condition, sidewalk

North Carolina Project Selection

A workgroup involving local agencies, MPOs, regional transportation planning organizations (RTPOs), and advocacy groups developed project prioritization criteria for the State DOT 10-year plan. The criteria addressed 10 performance areas and are periodically refined as part of an ongoing process.

MPOs and RTPOs submit projects to the State DOT after coordinating with local officials and transit agencies. The State DOT evaluates each project based on forecasted benefits and the ability to address existing needs.

The selection process has three levels, which differ in how quantitative data is balanced against qualitative data (such as stakeholder input and land use plans). State-level projects are selected mostly based on quantitative analysis; regional projects are approximately 70:30 quantitative to qualitative; and division projects are about an even split between the quantitative score and local input.

Prior to implementing this process, the plan's projects primarily added capacity with the intent of addressing existing congestion. As a result of this shift to a PBPP approach, the plan's projects focus more on modernization, which is expected to be more effective for improving mobility in the long term.

Peer Exchange: Focus on State DOTs with Pre-2018 Plans. Adobe Connect Meeting Room, August 28, 2020.

condition (beyond Americans with Disabilities Act compliance), and daily bicyclist/pedestrian counts.[103]

- The **Memphis Urban Area MPO** uses a context-specific project prioritization process. The Memphis MPO uses several themes to evaluate projects, including "connections and choices," "sustainable growth," and "system preservation." Instead of applying a uniform scoring system across all projects, the MPO adjusts the weights of each theme according to the investment "context type" based on land use. These context types provide a sense of scale and allow the Memphis MPO to balance regional and local needs.[104] The Memphis MPO uses a combination of quantitative and qualitative criteria; "no" responses are assigned zero points and "yes" responses receive the maximum amount of points for that category. These rankings are then provided to MPO committees, local governments, and other stakeholders.
- **MORPC**, the MPO for the Columbus, Ohio region, integrates PBPP into its funding allocation process by establishing six key goals, each of which have a set of performance criteria. Each project is evaluated using the set of criteria, which helps the staff assign a score to the project relative to each goal. Each project category has a target range for the funding amount. The criteria help staff decide how to allocate funding.[105]
- The **Pikes Peak Area COG**, the MPO for the Colorado Springs, Colorado area, uses performance metrics to evaluate the impacts of alternative investment decisions and to assess the effectiveness of various strategies. It has targets for measures such as annual transit ridership, percentage walking and biking, and the number of projects in urbanized areas based on traffic analysis zone population density. Each measure also has accompanying project scoring criteria and weight.[106]
- The **Tennessee DOT** uses an analytical deficiency software tool to identify needs among transportation program areas, which helps the agency determine investment distribution among funding programs for the 10-Year Strategic Investment Plan, based on those calculated needs and the policy direction of the LRSTP. The tool analyzes "structural deficiencies, roadway conditions, bicyclist/pedestrian conditions, freight infrastructure, economic development, safety issues, and environmental impacts" using a combination of data sources, such as the statewide travel demand model, U.S. Census, and Tennessee Roadway Information Management System. The tool can be made available to MPOs to provide an understanding of system needs, which may be helpful for MPOs to identify local priority projects.[107, 108]
- **Metro**, the MPO for the Portland, Oregon area, has a policy for promoting safety and security that states that the MTP will "prioritize investments that benefit people with higher risk of being involved in a serious crash."

Project rankings based on evaluation criteria are informative, but not always decisive. Some agencies adhere strictly to the results of the scoring process; however, most agencies have staff and board members review the results to ensure that they truly reflect the performance goals that they need to address. The project scores and rankings are used to inform rather than dictate the final decisions.

For many agencies, federally-required performance targets[30] also inform the discussions. SANDAG, in San Diego, California, for example, uses the congestion and safety measures, as well as some access-based measures, to present multiple transportation network options to board members and constituents. The performance measures help these stakeholders weigh various

[30] See 23 CFR 450.206(c) and 23 CFR 450.306(d).

options and provide targeted feedback. With this feedback, SANDAG develops a final strategy that aligns with the region's priorities. To improve the project selection process, SANDAG also is working toward understanding how project selection leads to certain outcomes.[109]

Strategies and Investments Selected to Improve Performance

The process of developing a performance-based long-range plan has led some agencies to invest in new types of strategies for improving performance. Within each performance area, the list of potential strategies for improving performance is beyond the scope of this study and report. Rather than attempting to provide an exhaustive list of options, this report now presents some of the strategies that the study team found agencies adopting into their long-range plan as a direct result of PBPP processes.

Several agencies in the study noted that their PBPP analyses and studies led them to shift their priorities for how they distributed funds to different activities. The three shifts that were mentioned most frequently were:

- Shift funds to system maintenance and preservation while lowering funds for system expansion.
- Shift congestion and reliability efforts to focus on operational approaches rather than expanding roadway capacity.
- Shift safety funding to low-cost roadway treatments and design that naturally slow vehicle speeds and reduce departure risk, such as via rumble strips and traffic calming methods.

Many agencies also use the long-range plan to share information about some of the planning work program activities that they are engaging in to improve performance. See Maximizing Planning Work Programs for ideas to apply to the work program, which often lead to the development of the long-range plan.

Table 3. Examples of long-range plan strategies selected as a result of PBPP.

Performance Area	Example Strategies*
Active transportation	▪ Include sidewalks or complete street designs on arterials (MORPC).[110]
Asset management	▪ Prioritize system preservation over system expansion (Des Moines Area MPO and MAPA).[111] ▪ Shift from "worst first" to "life cycle" approach that uses preventative measures (Hawaii DOT).[112] ▪ Prioritize bridge maintenance to prevent fair and good condition bridges from becoming "poor" condition (North Central Texas COG).[113]
Congestion and reliability	▪ Prioritize transit in urban areas and arterial improvements elsewhere (MAPA).[114] ▪ Prioritize operational improvements over system/capacity expansion (DVRPC and New Mexico DOT).[115] [116]
Economic development	▪ Increase transit access to downtown (Madison Area TPB).[117]

Performance Area	Example Strategies*
	▪ Ensure that roadways can accommodate farm equipment in agricultural communities (Madison Area TPB).[118]
Environmental sustainability and resilience to natural hazards	▪ Dedicate a proportion of funding to projects that improve air quality (FAST Planning).[119]
Safety and security	▪ Dedicate funding to low-cost, highly effective safety improvements, such as rumble strips, wider shoulders, brighter pavement markings, and high-friction surface treatments (South Carolina DOT).[120] ▪ Shift more emphasis to safety projects rather than projects focused on economic development or congestion (BRTB and its local jurisdictions).[121]
Transit	▪ Implement priority routes identified in the Statewide Intercity Bus Study (Vermont Agency of Transportation).[122]

Enhancing Programming

State and metropolitan transportation improvement programs (STIPs/TIPs) are the product of extensive advance work that is undergone to develop long-range plans, 10-year plans, corridor and other local-scale plans, and other performance-based plans. This advance work of studies and plans feeds into the project list of what will be implemented as part of the STIP/TIP.

Many STIPs/TIPs are simply project lists that are included as an appendix or incorporated by reference; these advance activities led to the project list. Others document additional activities that the agencies used specifically for developing the TIP. Under Federal requirements, STIPs/TIPs must include, to the maximum extent practicable, a discussion of the anticipated effect of the STIP/TIP toward achieving performance targets (23 CFR 450.218(q) and 23 CFR 450.326(d)).

This section provides ideas for incorporating PBPP into programming. See the other sections of this chapter for ideas that may apply to the advance work that leads up to developing the TIP.

Prioritizing Projects for Inclusion in the STIP/TIP

The processes for selecting projects for the STIP/TIP vary widely across agencies and use performance data to various degrees. Many agencies are moving toward using performance-based approaches to inform the selection of projects for inclusion in the STIP/TIP. Some agencies have formal project scoring or evaluation processes that use criteria to rank projects. These processes usually produce a ranked list as a first step in screening, and that list is then refined by agency staff, board members, and public input.

Some agencies prioritize projects within overarching program categories, funding categories, or goal areas, while others attempt to prioritize projects across an array of different goals.

- The **Atlanta Regional Commission (ARC)**, in Georgia, has a structured TIP prioritization process, which uses a key decision point framework for evaluating projects. First, ARC initiates a

call for projects, which does not focus on a single funding category but is universal. Next, ARC uses policy filters to remove projects that do not match regional policy. Third, ARC staff evaluate and score the projects. This scoring process involves organizing projects into categories (e.g., bicyclist, pedestrian, roadway expansion, roadway transportation system management and operations, transit expansion, roadway asset management, transit asset management), with different performance criteria applied to project categories as appropriate. Finally, additional factors are considered, such as sponsor priority, regional equity, and cost-benefit, which are not addressed solely through the performance-based evaluation process. It should be noted that the Georgia DOT's projects, which are fully funded through State and Federal funds allocated to the Georgia DOT, do not go through the full framework process.[123]

- The **East-West Gateway COG**, the MPO for the bi-State St. Louis, Missouri region, uses a performance-based approach to prioritizing projects within individual funding categories. For local programs, a call for Congestion Mitigation and Air Quality Improvement (CMAQ) and Surface Transportation Block Grant Program (STBG) project applications is issued. For STBG projects, Council staff then evaluate the local projects submitted for inclusion in the TIP with respect to the 10 guiding principles that make up the framework of the long-range transportation plan using a Scoring Criteria Guide to assess performance effects. Points are assigned in relation to usage of the facility and cost, and then projects are ranked based on the total score. For CMAQ projects, additional consideration is made regarding emissions reduction. State highway and bridge projects using other funding sources and transit projects using FTA funds are selected through other processes by the Illinois DOT, the Missouri DOT, and the St. Louis regional public transit provider, Metro Transit.[124]
- The **South Dakota DOT** prioritizes infrastructure maintenance projects for inclusion in the STIP using pavement and bridge management systems. These systems prioritize projects based on a cost-benefit analysis, rather than a worst-first model.[125]

Qualitative evaluation criteria are often used in situations where the potential benefits are not easily quantified or where the agencies are still developing their understanding of how to assess potential benefits. These qualitative options often require a yes/no selection by project sponsors, accompanied by an explanation that will be evaluated by agency staff. The **Denver Regional COG**, in Colorado, has safety and security-related criteria that says, "Describe how the project will improve transportation safety and security."[126]

Weighting of quantitative criteria is a way for agencies to favor projects that are the most on point for achieving the desired performance outcomes while still balancing other interests.

- **DVRPC**, the MPO for the greater Philadelphia region, which encompasses parts of Pennsylvania and New Jersey, has a detailed set of project evaluation criteria that is used to guide TIP and MTP decisions. DVRPC includes parent criteria (e.g., multimodal use, weighted at 9 percent), child criteria (person-trips, weighted at 37 percent of the multimodal use score), and rating scales for each topic. DVRPC develops TIP criteria by building off of regional asset management systems, which includes data on transit, bridge, and pavement assets. TIP criteria include rewarding points for transit projects that bring the asset into a state of good repair, extend the useful life of an asset, or qualify as a critical transit safety project. DVRPC uses PennDOT's Decision Lens software program to weight the criteria and evaluate alternatives.

- The **Pima Association of Governments (PAG)**, in Arizona, uses 18 performance measures when scoring projects submitted to the TIP and applies weights to priority performance areas.[127]

A mixed approach uses qualitative criteria, quantitative criteria, existing conditions, and forecasted benefits. MORPC, the MPO for the Columbus, Ohio region, evaluates projects against several performance areas that each have their own criteria. Criteria and weights vary depending on the project type. A few examples include the following: [128]

- Health, Safety, and Welfare criteria include data on existing conditions, such as crash frequency, crash rate, and the severity index.
- Sustainable Neighborhoods and Quality of Life criteria include the estimated number of business and residential displacements.
- Economic Development criteria include the following:
  - » Effect on nearby property values, vacancy rates, or other development factors
  - » Amount of private financial support to be provided to the project
  - » Number of permanent jobs and corresponding average hourly wage to be created and retained in the region because of the project (and documentation to support it)
  - » Current and future annual average daily traffic
  - » Percentage reduction of truck traffic in 2040 VMT within 1 mile of the project that experiences a Level of Service E or worse
  - » Existing travel-time uncertainty index within a mile of the project
  - » Travel delay reduction per person during peak periods in the model's forecast year

Pima Association of Governments

The Pima Association of Governments provides multiple methods for member agencies to determine whether their proposed transportation improvements will further the region's goals and needs (which were originally outlined in the long-range plan that feeds into the TIP). The MPO walks its member agencies through the application process to ensure that applicants make the connection between existing conditions and addressing priorities.

PAG maintains an interactive geospatial data portal that shows all known deficiencies in the region and overlays local projects for submission into the TIP. Member agencies can view their projects to determine whether the project's goals are addressing issues identified for that geographic location and adjust their projects accordingly, if appropriate.

The MPO also maintains a performance dashboard, which provides statistics on current conditions such as crashes, pavement condition, transportation interactions with riparian areas, freight reliability, and the presence of sidewalks.

Interview with the Pima Association of Governments. August 25, 2020.

Performance measures and project scoring criteria may influence the projects proposed by local governments and other agencies.

- **KIPDA**, the MPO for the Louisville, Kentucky region**,** uses performance measures to score the projects submitted via the calls for projects, which sometimes lead project sponsors to amend the scope of the project.[129]
- For the **National Capital Region TPB**, in the Washington, DC region, the CMAQ emissions reduction measures and targets are leading to a new set of projects being funded with the program in Maryland and DC, and being included in the TIP. These are very small amounts of funding; however, more quantitative calculations and some different project choices are starting to be made.[130]
- The **PAG** maintains an interactive geospatial data portal that documents all known performance and system condition information in the region. PAG overlays proposed projects for the TIP submitted by local jurisdictions, which helps PAG and member agencies determine whether the project's goals are addressing issues identified for that particular area. PAG works with local jurisdictions using this data tool to help them prioritize or change projects to best address system needs and priorities.[131]

Project selection processes provide opportunities to **understand tradeoffs and co-benefits** among performance areas. The project selection process in the **Walla Walla Valley MPO**, in Washington and Oregon, was performance-based before the Federal performance measures were fully completed. Due to the small amount of funding available as a small MPO, they try to identify projects that impact multiple performance areas. The MPO tries to select projects that will work in concert with one another over a long period of time, with the hope that there will be long-term systemic impacts. The MPO has always looked for projects that promote safety.[132]

Influence of Other Plans on the STIP/TIP

Long-range plans are not the only plans that feed into the STIP/TIP; 10-year strategic plans, corridor plans, modal plans, and other federally-required performance-based plans (e.g., Strategic Highway Safety Plans (SHSPs), State Transportation Asset Management Plans (TAMPs), State freight plans, Transit Asset Management [TAM] Plans) are used as preliminary work to prepare the list of projects that will be programmed.

Other plans influence the STIP/TIP in a variety of ways, such as being merely **informative to project sponsors** as they consider what projects to select, **producing a project list** that moves directly into the TIP, or producing data that serves as **inputs or criteria for the project selection process**.

- Previously, the **New Jersey DOT** primarily used engineering judgment to select bridge and pavement projects. Now, it selects STIP projects using priorities outlined in the TAMP. The New Jersey DOT plans to use a bridge management system (AASHTOWare BrM) to conduct a performance gap analysis for the TAMP.[133]
- The **Wilmington Area Planning Council (WILMAPCO)**, the MPO for the Wilmington region in Delaware and Maryland, uses information from its freight studies as part of its project scoring process for TIP projects. One of the TIP project selection process goals is "Support sustainable economic development and goods movement." Within that goal, one of the criteria uses "Scores using the bottlenecks identified in the [MPO's] freight & goods movement analysis."[134]

- At the **Wyoming DOT**, the TAMP describes pavement and bridge investment strategies and priorities, and a safety management system plan does the same for safety. The STIP prioritization process was designed to align with the priorities from those plans, and project sponsors were encouraged to select appropriate recommended strategies.[135]

The other plans also can serve as an **intermediate step between the long-range plan and the STIP/TIP**. The **DVRPC** CMP for the Philadelphia region "advances the goals of the long-range plan and strengthens the connection between the plan and the TIP" by prioritizing congested corridors and multimodal projects, such as bicyclist/pedestrian facilities, in order to mitigate congestion and support long-range land use goals.[136]

Some plans also **support interagency coordination** because the MPO plans can be used to assist the State in developing their plans and vice versa.

- The study found that most TIPs and several STIPs (e.g., Georgia, Massachusetts, Wisconsin) incorporated performance targets, measures, goals, and objectives or other relationships to the CMPs.
- Transit asset management plans primarily influence MPOs' TIPs (rather than STIPs), which they did at MPOs such as the **Hernando/Citrus County MPO** in Florida and the **North Jersey Transportation Planning Authority** (NJTPA). A few STIPs (e.g., **Colorado**, **Massachusetts**) were also influenced by transit asset management plans.

For more ideas, see Influence of Other Plans on the Long-Range Plan.

Understanding and Communicating Impacts of the STIP/TIP

As with the long-range plans, agencies are using existing modeling and forecasting tools to understand and communicate the impacts of individual projects and of the full program of projects. Agencies use their travel demand models to forecast the impacts of projects and the full program on congestion and other measures that can be produced via the model and post-processing.

STIPs/TIPs are beginning to describe the anticipated effects that the programs will have on achieving progress toward the agencies' goals and targets.

- The **New York Metropolitan Transportation Council's (NYMTC)** 2020–2024 TIP includes a section that discusses the anticipated effects of the TIP on achieving statewide performance targets established under the national performance goals.[31] This section provides NYMTC's general plan for improving performance and lists examples of specific projects in the TIP, organized by local agency, which are expected to improve that performance area based primarily on the project's stated purpose or goal.[137]
- The **Idaho Transportation Department (ITD)** uses scenarios to allocate funding for optimal system performance. ITD conducted scenario testing to assess the impacts of funding strategies on the percentage of pavements and bridges in good or fair condition. These scenarios allowed the Board to review the tradeoffs among the different funding levels. As a result of these scenarios, the Board approved increasing safety and capacity funding, reducing pavement funding, and reducing bridge funding.[138]

[31] See 23 CFR 450.326(d).

- The **Rockingham Planning Commission**, an MPO in Rockingham County, New Hampshire, describes the relationship among TIP targets, funding, and performance. For example, in the 2019 TIP, the MPO described targets and trends for Interstate pavement condition, non-Interstate National Highway System (NHS) condition, and NHS bridge condition. The MPO had already surpassed the 4-year targets for Interstate pavement condition and non-Interstate NHS pavement condition; however, it had not yet achieved the bridge targets. In alignment with the targets, many of the infrastructure projects are focused on bridges, including rehabilitation or replacement of three "high-investment bridges."[139]
- **Metro**, the MPO for the Portland, Oregon region, included a discussion of how the TIP helps achieve RTP performance targets. The assessment is based on the RTP's four priority areas: safety, equity, climate, and congestion, and primarily relies on the travel demand model, emissions model, and geographic information system (GIS) analyses to predict anticipated impacts. Each performance area included in the analysis shows modeled impacts from the TIP investment scenario vs. a no-build scenario. The TIP includes additional performance measures beyond what is in the RTP.[140]
- The **Pima Association of Governments'** TIP includes a performance assessment, describing the anticipated effects of the TIP and how the investments of the TIP are linked to performance targets identified in the RTP. Each performance area section provides a general overview of how TIP projects relate to that area, as well as the progress they are making toward performance measures and targets related to that area.

Strategies and Investments Selected to Improve Performance

Many agencies have begun prioritizing or working with partner agencies to prioritize projects programmed in the TIP that have strong potential to improve performance (in one or more performance categories). There are many types of strategies to improve performance in each area, and these strategies are deserving of their own study and report. It is rarer (currently) for agencies to specify that a project is actually selected due to its ability to improve performance; however, agencies are beginning to make this connection. Table 4 presents sample strategies that agencies explicitly use to improve performance, which were identified in this study; this is not an exhaustive list as it characterizes the range and types of strategies commonly used in STIPs/TIPs.

Table 4. Examples of STIP/TIP strategies selected as a result of PBPP.

Performance Area	Example Strategies
Active transportation	▪ Bicycle infrastructure and amenities (NYMTC and PAG).[141] [142]
Asset maintenance	▪ Identify locations where multiple asset owners have assets that need upgrades and bundle the upgrades into one project to save on costs (Rhode Island DOT).[143]
Congestion and reliability	▪ Dynamic message signs (FAST Planning).[144] ▪ Bus pullouts (PAG).[145]
Environmental sustainability and resilience	▪ Electric buses (NYMTC).[146]

Performance Area	Example Strategies
	▪ Wildlife habitat linkages (PAG).[147]
Equity and health	▪ Reduce commuting times for residents of equity-focused areas, providing transportation connections between equity-focused areas and employment centers (Oregon Metro).[148]
Safety and security	▪ Convert dangerous intersections to roundabouts (FAST Planning)[149] ▪ Low-cost safety improvements, such as speed humps and intersection chokers (FAST Planning).[150] ▪ Americans with Disabilities Act-compliant ramps, bicyclist/pedestrian amenities, signal installation, road widening, and signage and visual improvements (COMPASS).[151]
Transit	▪ Bus signal priority projects, bus rapid transit/high-occupancy vehicle (HOV) lanes (NYMTC).[152] ▪ Replace aging public transit vehicles (PAG).[153]

Maximizing Planning Work Programs

MPOs and the State DOTs are using Federal planning funds and undertaking activities in their Unified Planning Work Programs (UPWPs) and State Planning and Research (SPR) Work Programs to address transportation system performance. **Agencies are incorporating investments and activities related to performance topics that involve data collection, collaboration, special studies, and more in their work programs.** UPWPs and SPR Work Programs provide agencies with an opportunity to address performance through their own initiatives. Agencies can take creative approaches to improving performance through targeted programs, research, grant funding, or other programs.

The research team scanned the tables of contents for 41 UPWPs and 10 SPR Work Programs for topics related to performance and conducted a more extensive review of the 10 SPR Work Programs and a sample of 12 UPWPs for their projects or programs related to performance. Table 5 shows the percentage of scanned UPWPs and SPR Work Programs that included section headings related to performance in their tables of contents (TOCs). The most commonly occurring topics were public involvement, partnerships, public transit performance, and air quality.

Table 5. Percentage of work program TOCs that included headings related to performance topics.

Performance Areas	UPWP TOC	SPR TOC	Total Percentage[32]
Active Transportation	49%	40%	47%
Air Quality	54%	30%	49%
Asset Condition	12%	60%	22%
Congestion	46%	50%	47%
Economic Development	12%	0%	10%
Energy and Water Conservation	7%	0%	6%
Freight Transportation	39%	50%	41%
Land Use Linkages	39%	20%	35%
Partnerships	56%	60%	57%
PBPP	39%	0%	31%
Public Involvement	78%	10%	65%
Public Transit	63%	0%	51%
Resilience	12%	30%	16%
Safety	34%	50%	37%
Security	10%	0%	8%
Social Equity/Health	51%	0%	41%

As shown in Table 5, many work programs have investments and activities related to specific performance topics. Most of these agency practices can be categorized into four main types:

1. **Collaboration** with other agencies to develop plans, tools, programs, and initiatives
2. **Data Collection and Analysis**, including gap analyses, GIS analysis, surveys, and developing databases
3. **Plans and Studies** to better understand the performance needs and identify strategies to implement to improve performance
4. **Technical Assistance and Incentive Programs**, including grant programs, toolkits, and other means of educating planning partners and stakeholders

[32] Total percentage is the combined percentage calculated by combining the number of UPWP and SPR TOCs reviewed.

The tables in Appendix E, Planning Work Program Strategies and Activities by Performance Topic, provide some ideas to consider for inclusion in UPWPs and SPR Work Programs to address the following performance areas:

- Active Transportation
- Congestion and Reliability
- Economic Development
- Environmental Sustainability and Resiliency to Natural Hazards
- Equity and Health
- Freight
- Land Use Linkages
- Pavement and Bridges
- Safety and Security
- Transit

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Chapter 3. Noteworthy Examples by Agency Type

Although the earlier chapters of this report contain many examples of noteworthy practices, those examples are limited to highlighting a particular outcome or a particular step in the planning process. In this chapter, the report compiles the stories of a few agencies of each type and size.

State DOTs

This report sorts the State departments of transportation (DOTs) by population, creating three groups based on where the 2010 U.S. Census data show breaking points. The State DOTs were organized into large (population of more than 8 million), mid-sized (population between 2 million and 8 million), and small (less than 2 million) groups.

Large States

Large States are defined here as those with a population size of 8 million or greater in the 2010 U.S. Census, including California, Florida, Georgia, Illinois, Michigan, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, and Virginia.

Texas[154]

Texas DOT created a cloud-based project prioritization tool called Performance Metrics: Data Integration System (PM-DIS) to store project information and run assessments on those projects. The PM-DIS tool was initially designed to serve as a need-based prioritization tool; however, it was then redesigned to include predictive analysis of projects based on performance categories. Federally required measures, as well as additional State measures, are included in the tool.

Texas DOT Highlights

- Evaluates projects for inclusion in the 10-Year Plan using standardized project data available to project sponsors via a cloud-based prioritization tool.
- Convenes a stakeholder group to identify priority corridors.

The Texas DOT uses PM-DIS to assess projects submitted by Texas districts and metropolitan planning organizations (MPOs) for inclusion in the Unified Transportation Plan, using standard data and consistent analyses for all projects. Each Texas DOT district and MPO is allocated a specific amount of funding for their projects, which is determined by the region's needs and geographic equity. The Texas DOT districts and MPOs run an assessment of their priority projects, evaluate as needed based on that assessment, and rank them for inclusion in the Unified Transportation Plan. The DOT continually adjusts the tool to add enhancements (such as the recent addition of mapping capabilities) and updates to performance measures and analyses. Prior to the use of PM-DIS, projects were evaluated inconsistently, which made it challenging to prioritize projects effectively.

An interagency workgroup identifies priority corridors and determines whether the projects submitted for the Unified Transportation Plan are addressing the needs of those priority corridors. Each project is evaluated in comparison with similar projects from peer agencies, using evaluation criteria with

weighted categories. The State DOT, District engineers, and MPO staff jointly establish and refine the weighted criteria.

Virginia[155]

A 2014 Virginia law required the development of a neutral, performance-driven planning and funding process. The resulting framework is known as SMART SCALE, which stands for System Management and Allocation of Resources for Transportation, a process that evaluates project metrics using key performance measures addressing improvements to Safety, Congestion mitigation, Accessibility, Land use coordination, and Economic development and environmental quality.

Virginia OIPI Highlights

- Virginia's SMART SCALE framework analyzes projects for inclusion in the long-range plan.
- The program includes a public dashboard to improve transparency of the planning process.
- Virginia continues to research and develop improvements to the process.

The **Virginia Office of Intermodal Planning and Investment (OIPI)** collaborated with the **Virginia DOT, Department of Rail and Public Transportation, and local and regional governments** to develop a scoring system to rank projects. SMART SCALE evaluates projects based on performance measures that address improvements to safety, congestion mitigation, accessibility, land use coordination, and economic development and environmental quality.

VTrans (Virginia's multimodal Long-Range Statewide Transportation Plan [LRSTP]) establishes the needs, SMART SCALE implements solutions to those needs, the SMART SCALE program team assesses the impacts of proposed investments on performance against those needs, and the results inform the next VTrans needs assessment and the refinement of SMART SCALE evaluation criteria.

SMART SCALE, which is used to score projects funded in Virginia's 6-year improvement program, prohibits State agencies from submitting projects; all projects must originate at a local jurisdiction, region, or public transit provider. The protocol of clear, defined local support for proposed projects strengthened public support and the belief that the funding decision-making process is objective.

To further build transparency and trust, a SMART SCALE dashboard[33] enables decision-makers and the public to monitor the implementation of projects funded through SMART SCALE. The dashboard informs stakeholders, educates the public, and communicates the overall process and results for SMART SCALE. "It includes training videos, a link to the SMART Portal, project scorecards, raw scoring calculations, access to all application details, and interactive mapping."

Prior to the use of SMART SCALE, transportation projects often lacked regional or local stakeholder support and encountered resistance when being implemented. The use of SMART SCALE has led to greater consistency, accountability, and public confidence regarding the selection of projects.

To further improve SMART SCALE, Virginia OIPI is conducting work to:

[33] VASmartScale.org

- Identify methods to assess the impacts of projects funded under SMART SCALE to determine whether the anticipated benefits have been achieved.
- Develop a "Project Pipeline" methodology to help local and regional agencies create a deliberative approach that identifies effective solutions to identified needs. The proposed methodology would use the agency's existing Strategically Targeted Affordable Roadway Solutions approach.[156]

Mid-Sized States

Mid-sized States are those with a population size between 2 million and 8 million in the 2010 U.S. Census, including Alabama, Arizona, Arkansas, Colorado, Connecticut, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Nevada, New Mexico, Oklahoma, Oregon, South Carolina, Tennessee, Utah, Washington, and Wisconsin.

Kentucky[157]

The **Kentucky Transportation Cabinet (KYTC)** developed a data-driven project prioritization process called the Strategic Highway Investment Formula for Tomorrow (SHIFT), which they modeled after a similar process used in North Carolina. The agency developed the approach for its 10-year State Highway Plan to reduce over programming, effectively compare capital improvement projects, and strategically plan construction projects.[158]

Kentucky Transportation Cabinet Highlights

- Data-driven project selection process with different approaches for statewide, regional, and local priorities
- Ongoing refinements to improve the process, such as in relation to safety and resiliency

SHIFT scores projects based on five key attributes: safety, asset management, congestion, economic growth, and a cost-benefit analysis. Safety scores are based on performance (crash-related measures) and geometric considerations (roadway widths/geometry). Congestion scores use travel-time savings forecasted by the statewide travel demand model. The Transportation Economic Development Impact System (TREDIS) economic modeling tool is used to evaluate the economic impact. The cost-benefit analysis considers the costs of crashes, delays, and the overall project cost, including right of way, utilities, and construction.

KYTC scores projects of State, regional, and local significance.

- Local agencies may add 15 points to their top-priority projects to boost those projects. As local agencies have adapted to this system, they have learned to communicate with adjacent localities to identify projects of shared interest; multiple local agencies will then agree to boost the same projects.
- To balance regional needs, KYTC divided Kentucky into four geographic regions and ensures that a portion of funding goes to each to support regional projects. A data-driven model could have resulted in all funding being channeled just to the regions having the greatest population and lane mileage.

The list of projects for the State Highway Plan must be approved by the legislature. KYTC worked to educate members of the legislature and explain the data-driven, transparent process during the

rollout of SHIFT. Because KYTC could demonstrate that the process is primarily objective, they were able to maintain support for the State Highway Plan even when a new administration took office.[159]

SHIFT is a continually evolving process.

- KYTC saw that their methodology did not account for the severity of crashes, so they added analytical approaches from the American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual.
- KYTC also is exploring two new measures: criticality and redundancy. The motivation for these measures comes from issues related to the mountainous eastern region of the State, where significant accessibility issues arise when major routes are closed. Criticality is measured via the statewide travel demand model by the number of regional node-to-node trips which use that segment; a redundancy measure would be travel-time differences in the travel demand model with and without that network segment.
- Many of the projects in the list come from other plans (e.g., the State freight plan), and KYTC hopes to include methods for assessing tradeoffs among the various plans in future years.

Oregon[160]

The **Oregon DOT** had well-organized documentation of its planning work program, which offers numerous studies and other options for improving the performance of its plans and STIP.

Oregon DOT Highlights

Well-documented planning work program with numerous studies and approaches for improving performance in areas such as active transportation, asset management, and safety

Active transportation efforts include the following studies:

- Development of guidance on context-sensitive design
- An Active Transportation Needs Inventory
- Bicyclist and pedestrian performance measures and data program development
- Impacts of intersection treatments and traffic characteristics on bicyclist safety
- Methods for Nonmotorized Travel Activity Estimation and Crash Analysis.

Asset management and resilience studies include the following:

- Resilient and Rapid Repair Measures for Seismically Vulnerable Bridges
- Improving the Constructability and Durability of Concrete Pavements
- Monitor Coastal Landslides and Bluff Retreats for Targeted Risk Assessment

Safety studies focus on extensive data analysis, particularly as they try to understand cause and effect, and include the following:

- Framework to Evaluate Causes and Effects of Truck Driver At-Fault Crashes in Oregon
- Reversing Oregon's Rise in Deaths and Serious Injuries for Senior Drivers and Pedestrians
- Enhancements of Oregon DOTs Project Safety Management System, which includes reviewing 55,000+ files on annual statewide crashes on public roads

Wisconsin

The **Wisconsin DOT** takes an interagency coordination approach to implementing performance-based planning and programming (PBPP). The State DOT hosts monthly meetings with representatives from different functional groups across the agency and with Federal Highway Administration (FHWA) representatives, where agencies "envision how all of the pieces fit together."

Wisconsin DOT Highlights

- Hosts regular interagency meetings to discuss PBPP implementation.
- Used pavement condition models to win additional highway maintenance funding from the State legislature.
- Includes land use planning strategies in the Long-Range Plan.

The State's Congestion Mitigation and Air Quality Improvement (CMAQ) project selection process is a collaboration among the Wisconsin DOT, Wisconsin Department of Natural Resources, and the Southeastern Wisconsin (Regional Planning Commission (RPC). These agencies work together to perform modeling and analysis, which is used to score CMAQ projects based on projected emissions reduction estimates. Many of the projects selected through this process are multimodal.[161]

The Wisconsin DOT used performance condition data and analysis to make a case to obtain additional funding. Using the pavement condition model, the agency compared the amount of proposed funding for maintenance to the amount needed to maintain current conditions on the highway. The DOT used this information to make its case to the State legislature for additional funding, securing an additional $185 million for its budget.

The Wisconsin DOT lists strategies in the LRSTP to coordinate transportation and land use projects to achieve positive outcomes. The LRSTP explains potential direct and indirect land use effects of transportation decisions, including displacement, agricultural impact, noise effects, changes to community character or cohesion, and environmental impacts. It also lists several strategies to enhance the land use/transportation relationship, many of which likely take place as part of their planning work program. Examples include:

- Train staff on the analysis of the indirect and cumulative effects of transportation projects.
- Coordinate State transportation efforts with local comprehensive plans and land use activities.
- Compare statewide transportation plans with Federal, State, and tribal conservation plans, maps, and inventories of natural and historic resources.

Small States

Small States are defined here as those with a population size less than 2 million in the 2010 U.S. Census, including Alaska, Delaware, District of Columbia, Hawaii, Idaho, Maine, Montana, Nebraska, New Hampshire, North Dakota, Puerto Rico, Rhode Island, South Dakota, Vermont, West Virginia, and Wyoming.

Nebraska

The **Nebraska DOT** has used several data inputs for allocating special funds received from the State legislature to build new roads. The DOT engaged more than 2,000 stakeholders to learn about

"wants" and "needs." In addition to this extensive stakeholder input, they collected and evaluated data on engineering factors, economic factors, and other performance issues. The performance data and stakeholder input were then combined with existing State priorities to identify the list of projects that were of highest priority.

To allocate Highway Safety Improvement Program (HSIP) funding, an interdisciplinary group meets regularly to identify safety focus areas and State safety priorities. The group then evaluates and selects the projects by comparing how the projects relate to those focus areas, priorities, and crash modification factors.

Nebraska DOT Highlights

- An interdisciplinary group allocates HSIP funds in alignment with State safety priorities and crash modification factors.
- The agency considers engineering factors, economic factors, and stakeholder input to prioritize projects for special funding from the State legislature.

Staff at the Nebraska DOT are currently working through options for establishing evaluation criteria for use in creating the Statewide Transportation Improvement Program (STIP) project list. They are evaluating past projects against a set of performance criteria that they will evaluate and refine prior to developing their prioritization framework or related tools.

Rhode Island

The **Rhode Island DOT** also houses the **State Planning Council**, the only MPO in the State. The Rhode Island DOT, the State Planning Council, and the Rhode Island FHWA Division Office held biweekly lunch meetings to discuss the Moving Ahead for Progress in the 21st Century Act (MAP-21), the Fixing America's Surface Transportation Act (FAST Act), and related regulations as they relate to transportation performance management (TPM) and PBPP. The lunch meetings acted as peer-to-peer training with agency staff taking turns reading different sections of the law or regulations, and teaching one another the requirements.[162]

Rhode Island DOT Highlights

- The LRSTP has long-range goals and performance measures to promote emergency response and safety.
- A new geospatial tool will allow the Rhode Island DOT to prioritize and order new projects strategically.

The Rhode Island DOT's LRSTP includes goals, objectives, policies, strategies, and performance measures related to a variety of performance areas.[163] Two examples of these goals and performance measures follow:

- Goal: Develop transportation and communication systems that serve Rhode Islanders and the region in the event of natural disasters, accidents, and acts of terrorism in a manner that minimizes injury, loss of life, and disruption to the economy; facilitate the evacuation of people; and allow emergency response and recovery activities to occur. Performance measures related to this goal include:
  - » Improve incident clearance time on Interstate highways from an average time of 40 minutes in 2008 to 38 minutes in 2010, 35 minutes in 2020, and 30 minutes in 2030.

  - » Primary routes to all hospitals with emergency care facilities should function at Level of Service C or better by 2015.

- Goal: Improve the safety of all transportation modes through education, enforcement, and engineering solutions. Performance measures related to this goal include:
  - » Reduce the crash rate per 100 million VMT from 588 in 2001 to 470 in 2015, 400 in 2025, and 375 in 2030.
  - » Reduce the number of alcohol-related fatalities from 48 in 2001 to 35 in 2015, 26 in 2025, and 21 in 2030.
  - » Reduce the number of serious pedestrian injuries from 94 in 2001 to 88 in 2015, 83 in 2025, and 80 in 2030.
  - » Increase seatbelt use from 74 percent in 2003 to 85 percent in 2015, 92 percent in 2025, and 94 percent in 2030.

The Rhode Island DOT is developing a new geospatial tool that will allow the agency to identify opportunities to overlap projects to improve performance efficiently. For example, the agency would analyze pavement condition data for a road with a proposed intersection redesign, and if the pavement was forecasted to need resurfacing in the near future, the agency may recommend advancing the timeline for resurfacing to align with the intersection project. The agency also has prioritized "immediate need" investments, which, based on performance analysis, will improve the overall condition of the State's assets.

MPOs

Multi-State MPOs

The multi-State MPOs are defined here as those that encompass more than one State in their planning area.

Delaware Valley Regional Planning Commission[164]

The **Delaware Valley Regional Planning Commission (DVRPC)** is the MPO for the greater Philadelphia region, which encompasses parts of Pennsylvania and New Jersey. Both States have given the MPO region significant decision-making capabilities in developing the Transportation Improvement Program (TIP) and the Metropolitan Transportation Plan (MTP). DVRPC works with county governments and other planning partners to develop projects for both documents. The use of data in the MTP process has progressed over the past 20 years. DVRPC currently uses data for developing needs assessments and allocating forecasted revenue into funding categories, as well as for project evaluation criteria.

DVRPC Highlights

- DVRPC uses decision-making software for its data-driven project evaluation process.
- DVRPC helps its transit agencies transition to a performance-based approach.

The MPO's project evaluation process has evolved over time to a data-driven approach, using screening factors and evaluation criteria focused on performance. Each factor was weighted using Decision Lens, a decision-making software, with different weights used among funding categories. The agency used data from databases, such as crash and crash modification databases, to score projects.

DVRPC revisits the prioritization process each time the MTP is drafted to ensure that it continues to align with regional values. In the next update to the plan, the agency will increase the importance of equity in the selection process.

DVRPC solicits projects from member counties and uses a prioritization process to select a subset of those proposed projects for the TIP. The TIP has both set-asides and competitive funding programs, which use different selection criteria. These programs include HSIP funds, CMAQ funds, and Transportation Alternatives funds.

DVRPC has assisted public transit providers in the region, such as the **Southeastern Pennsylvania Transportation Authority (SEPTA), NJ TRANSIT**, and the **Delaware River Port Authority**, in transitioning their capital programs to use a performance approach to fund projects.[165] DVRPC also conducts joint planning studies with public transit providers. For example, DVRPC helped SEPTA conduct a trolley modernization analysis.[166]

Aside from transit, DVRPC works with and assists partners in various performance areas. The MPO is particularly collaborative in relation to environmental sustainability and resiliency. DVRPC helps partners implement energy efficiency practices, plan for resilience, and conduct impact analyses. They also provide resources and training to business and property owners on energy efficiency improvements and preparing for the impacts of climate change.[167]

Memphis Urban Area MPO

The **Memphis Urban Area MPO** is a bi-State MPO that encompasses areas of Mississippi and Tennessee. The agency assesses each proposed project for inclusion in the MTP using project-level performance measures. They compare system performance among the base year, the implementation of only existing and committed projects, and the implementation of all proposed projects. Five investment context types are used to provide a sense of investment scale for refining the performance measurement and project evaluation process, and to help balance regional and local needs. Projects were assigned to a context within the region and then evaluated by criteria to reflect a balance between livability and mobility. The five investment context types for projects are interregional, regional centers, town centers, neighborhood communities, and undeveloped. Each project-level performance measure was assigned to one of the five planning themes: Connections and Choices, Economic Vitality, Safety and Security, Sustainable Growth, and System Preservation. Within each investment context, the planning themes are weighted differently to reflect the level of significance of each measure to each context type.

Memphis Urban Area MPO Highlights

- Memphis MPO assesses projects within investment contexts that provide a sense of scale.
- The MPO conducts tradeoff analyses to inform investment decisions.

In the MTP, the MPO conducted a tradeoff analysis to evaluate potential options. “By varying the amount of funding available for roadway and bridge maintenance, the public and stakeholders can see the range of potential projected pavement and bridge conditions, as well as the number of capital projects to be built with the remaining funds.” The agency used this tradeoff analysis to inform investment decisions for the MTP.

The MPO forecasts future performance of planned investments. The MTP shows baseline performance, 2050 Existing and Committed conditions (roadways currently open for traffic and those identified in TIP), and a Livability 2050 scenario (roadways currently open for traffic and all fiscally constrained plan projects open for traffic). Conditions are projected for measures such as vehicle-miles traveled (VMT) per capita, mode share, and emissions.

The MPO has developed a coordination strategy for establishing tri-State CMAQ performance measures. The MPO meets with the Tennessee DOT, the Mississippi DOT, the Arkansas DOT, and the West Memphis MPO regularly to establish unified targets. The Memphis MPO also hosted a CMAQ Performance Measure workshop to coordinate with the other agencies, FHWA, and the MPO’s Engineering and Technical Committee.[168]

National Capital Region Transportation Planning Board

The **National Capital Region Transportation Planning Board (National Capital Region TPB)** is the MPO for the Washington, DC region, and is housed within the **Metropolitan Washington Council of Governments (MWCOG)**. The MPO covers the District of Columbia (DC) and parts of Virginia and Maryland, with members representing each of the States and local jurisdictions.

National Capital Region TPB Highlights

- TPB established regional targets through coordination efforts and used a blend of the three States’ methodologies.
- TPB included a regional safety study in the UPWP to address safety in relation to their data-driven safety targets.

To establish targets for the Federal performance measures, the MPO chose a blended approach of the three States’ three different methodologies. They proportionally applied State targets to establish regional targets. Collaboration on safety targets involved positive engagement with board members and coordination among jurisdictions, which led to more aspirational targets. The agency decided to establish regional, data-driven safety targets over adopting State targets. When the MPO first presented these data-driven targets to the Planning Board in 2017, the Board recommended more aspirational targets. The MPO then used the Unified Planning Work Program (UPWP) to fund a regional safety study of the region’s crashes and potential solutions to address safety in the region in relation to these new targets. In addition, the Planning Board asked the State DOTs in the MPO region to provide quarterly reports on activities to improve safety and added safety as a recurring discussion item on Planning Board meeting agendas.[169]

In 2020, the National Capital Region TPB evaluated all of their current performance measures compared with the region’s policy framework to identify any opportunities for alignment. They received recommendations on performance measures to evaluate forecasted MTP performance, as

well as to look back at historical trends to inform decisions. Recommended measures included equity, accessibility, and resilience, among others.[170]

Large MPOs

Baltimore Regional Transportation Board[171]

When Federal requirements were implemented, the **Baltimore Regional Transportation Board (BRTB)**, which is the MPO housed and staffed by the Baltimore Metropolitan Council (BMC), reviewed the Maryland State DOT performance targets to understand whether and how they aligned with regional system needs and priorities. After the analysis, the MPO decided to adopt its own targets for many of the measures to ensure that they were in line with regional goals and priorities.

Baltimore Regional Transportation Board Highlights

- The agency hired an epidemiologist to work with local counties to develop individualized SHSPs.
- BRTB assigns each project a technical score and a policy score in the evaluation process.

The Baltimore region has been making progress in vehicular highway safety but lagging on nonmotorized safety. The MPO had observed high bicyclist/pedestrian injuries and fatalities in specific geographic areas.[172] To address this issue, they are using local Strategic Highway Safety Plans (SHSPs), which identify specific needs for individual areas.

The **Maryland State Highway Safety Office** helped fund a BMC staff position (an epidemiologist) to work with each local county on individualized SHSPs to address the safety issues in that county. The end goal is to have the county SHSPs influence the State HSIP selection process. The county SHSP process engages many stakeholders, including police, education staff, planning staff, and the public works department. BRTB remarked that the process of developing SHSPs helped bring new awareness of issues; it was the first time that local stakeholders learned what their safety statistics looked like. The MPO assessed the root causes and primary locations of safety issues, which helped them develop strategies. As a result of this process—and without creating new incentives or requirements—project submissions now have a greater emphasis on safety. Projects previously focused largely on economic development and congestion; now, project submissions show how they will improve safety.

BRTB's performance-based selection process for the MTP shifted from a policy-focused process to a more data-driven process. In developing the new project selection process for the MTP, they removed the regionally significant category and created a greater emphasis on technical considerations and equity.

Planning staff were proactive in preparing for the upcoming Federal regulations and shift to PBPP, briefing the MPO's Board about it frequently, who saw the merits of a data-driven approach. The scoring process continues to include policy aspects; however, the weighting has shifted more to technical matters.

In general, the process includes a policy score by sponsors (based on the local agency's priority and demonstrated support) and a technical score by BRTB. There is an evaluation of where in the 25-year planning horizon a project would fit in the financial forecast. There also are revisions based on

equity among jurisdictions. BRTB caps the list based on these considerations and financial forecast limitations. The Technical Committee and the Public Advisory Committee review the draft list with the planning staff, who make some adjustments based on local priorities or other considerations.

Overall, BRTB keeps their process very transparent with decision-makers. They also make the scores public, as advised by the Public Advisory Committee. The MTP also is developed in a 10-step process, each of which involves a formal resolution by the Board. Through this continuous multi-year conversation, there are no surprises at the end.

Mid-Ohio Regional Planning Commission

The Mid-Ohio Regional Planning Commission (MORPC) uses quantitative performance measures to inform and support long-range planning processes. The MORPC MTP is centered around six broad goals related to energy consumption, natural resource protection, economic opportunity, sustainable neighborhoods, regional collaboration, and health and safety. Within each of these key goals, the MTP includes several objectives, quantitative performance measures, and targets.[173]

MORPC Highlights

- MORPC publishes a report card that shares progress on performance targets.
- The agency coordinates closely with the local transit agency on planning efforts.
- MORPC uses quantitative and qualitative project evaluation criteria to select projects.

For example, one of MORPC's key goals is to "[c]reate sustainable neighborhoods to improve residents' quality of life." There are three underlying objectives for this goal, including "target infrastructure development to serve a higher number of people and jobs, and increase sidewalk coverage of arterials and collectors." The performance measures for this objective are "number of people and jobs per acre within 0.75 mile of arterials" and "percentage of arterials and collectors that have sidewalks." The MTP lists the benchmark levels for these measures, 2020 targets, and 2040 targets.[174]

MORPC collects data on each performance area. To measure sidewalk coverage, for example, MORPC hired a consultant to collect data. Using aerial imagery, the consultant created a dataset of sidewalks and crosswalks. This dataset made it easier for MORPC to identify gaps in sidewalk coverage. At the time of publication of the MTP, 36 percent of arterials and connectors had sidewalk coverage. Setting short- and long-term targets helped them make incremental progress toward long-term goals.[175]

MORPC uses these measures to assess progress in each performance area through an annual "report card" that shows whether the region has met its targets, is on track to meet its targets, or is not on track to meet its targets for each performance area. MORPC developed these report cards to improve communication with local communities and MPO members. They also help key decision-makers consider long-term needs. Planning partners have told MORPC staff that they see great value in the report cards. For example, the president of the **Central Ohio Transit Authority (COTA)** keeps a copy of the report card on her office wall. Local agencies often do not have readily available data, so these report cards are helpful tools for understanding regional trends.

In addition to quantitative performance measures, MORPC also uses quantitative and qualitative project evaluation criteria to select projects. MORPC staff use evaluation criteria to assign projects a score between 0 and 20 for each of the six key goals. For example, one of MORPC's goals is to "position Central Ohio to attract and retain economic opportunity to prosper as a region and compete globally." Criteria for this goal include a project's effects on property values, the number of permanent jobs to be created because of the project, and travel-delay reduction per person during peak periods in the model's forecast year.[176]

MORPC is also noteworthy for its close coordination with its primary local public transit provider, COTA. COTA operates bus transit and oversees transit planning. MORPC supports the planning process and helps bring relevant stakeholders to the table. For example, for one bus rapid transit route, MORPC brought City of Columbus representatives and engineers together to coordinate planning. COTA also participates in MORPC's quarterly transit coordination meetings and Technical Advisory Committee, which meets 10 times per year.[177]

MORPC has implemented multiple strategies to reach targets. For its energy reduction goal, it uses many transportation demand management (TDM) strategies to reduce VMT. MORPC has a TDM Strategic Plan that guides its activities, including promoting coordination among local TDM agencies, promoting statewide coordination among rideshare MPOs, and marketing programs. MORPC also manages an online rideshare matching system called Gohio Commute, which it operates in partnership with other MPOs. To meet its target of increasing the number of jobs accessible by transit, MORPC encourages infill development, increased density, and employers locating near existing transit. MORPC collaborated with the City of Columbus to obtain free transit passes for 40,000 downtown workers.[178]

Pima Association of Governments

The **Pima Association of Governments (PAG)**, which serves as the MPO for the Tucson, Arizona urbanized area, conducts scenario planning exercises to inform investment strategies for the MTP and uses performance measures in their selection processes for MTP and TIP project lists. The agency shares performance data with member jurisdictions through an interactive data portal to help them develop projects that align with system needs and priorities.

Pima Association of Governments Highlights

- PAG uses scenario planning to guide investment strategy for the MTP.
- PAG maintains a geospatial data portal that overlays system deficiencies with proposed TIP projects and helps member jurisdictions refine projects based on performance data.
- PAG uses 18 performance measure scores and local priorities to inform project lists for the Regional Transportation Plan (RTP) and TIP.

In the development of their MTP, PAG conducted a scenario planning exercise, assessing the impact on 18 performance areas across 4 investment scenarios, which varied in scale and modal focus area. Based on anticipated performance outcomes, public comment, and technical review, PAG created a hybrid investment strategy, which was shared with member agencies to guide project selection for the MTP.

PAG's geospatial data portal maps all known deficiencies in the region and overlays projects submitted for the TIP. Performance data in the tool includes crashes, pavement condition, interaction with riparian areas, freight reliability, and the presence of sidewalks, among others. Member agencies can review performance data to evaluate how a proposed project would help meet specific performance measures and adjust their projects accordingly.[179]

PAG provides technical assistance to member jurisdictions and agencies as they are preparing applications for the TIP using this tool. The MPO walks through the application process to ensure that applicants make the connection between existing conditions and regional priorities and their projects. This process has improved the alignment of projects selected for the TIP with regional needs and priorities.

The TIP application scores each project based on 18 weighted performance measures. These scores, combined with local priorities and some consideration of geographic distribution, are used to inform discussions among PAG's Policy Committee to develop the final project list for the TIP.

Mid-Sized MPOs

Genesee County Metropolitan Planning Commission[180]

The **Genesee County Metropolitan Planning Commission (Genesee County MPC)** is the MPO for the Flint, Michigan metropolitan area.

Genesee County Metropolitan Planning Commission Highlights

The project selection processes include:

- A solicitation process for member jurisdictions
- Project scoring and ranking
- Evaluation by committees

For capacity-related projects, the Genesee County MPC conducts data analyses to help partner agencies develop capacity projects that will best address performance. Capacity-related projects must be identified as a deficiency to be eligible for inclusion in the MTP. The MPO runs capacity analyses for projects submitted for inclusion in the plan, which includes safety and incident data, the location of crashes, and traffic counts. These analyses are shared with their partner agencies and the MPO holds discussions to identify any issues not captured in the data analysis that may elevate the priority of the proposed project.

In the Genesee County MPC region, cities, towns, and jurisdictions develop and submit their own project proposals for inclusion in the TIP. The solicitation for the MPO's TIP is for nonmotorized, capacity, preservation, reconstruction, and transit projects.

Aside from reconstruction projects, all project applications are scored and ranked based on criteria developed collectively by the MPO Board and their technical committee members. The MPO staff makes the initial selection of the projects and provides each with a preliminary score. Based on the preliminary scores of the projects, the MPO creates a final list of recommended projects. This list is reviewed by the Genesee MPO Transportation Systems Management and Operations (TSMO) Subcommittee (comprised of representatives from the road commission, cities, and local public transit providers) and a Technical Advisory Committee. These committees do not change the scores

or ranking of the projects; however, they may make funding decisions, which apply universally, such as a maximum cost per lane-feet for a particular improvement.

The MPO Technical Advisory Committee submits its scores to the MPO Policy Committee, who makes the final decision on all projects to be included in the TIP. The MPO Board members then vote to adopt the final list.

Since the establishment of this data-driven process, the list of projects for the TIP has been determined by the data-driven scoring process, and the list has been unanimously approved. All member agencies of the MPO support the process, even if their own projects are not selected for funding in a particular year, because they see the connection between regional needs and priorities and the final programmed list, as well as the value of the transparency and objectivity of the process.

Community Planning Association of Southwest Idaho[181]

The **Community Planning Association of Southwest Idaho (COMPASS)** is the MPO for the Boise and Nampa, Idaho regions.

Scenario planning processes typically apply quantitative data and forecasting to support decisions. In 2006, COMPASS began monitoring and tracking performance of the transportation system. Over the years, they identified 64 performance indicators across 8 goals, which the agency narrowed down in recent years.

COMPASS Highlights

- COMPASS uses a benchmarking process to project the impacts of investments.
- The agency installed bicyclist and pedestrian traffic counters to improve performance data.

The scenario planning process helped the MPO focus on reviewing goal-focused alternatives rather than just tracking performance. For the last plan update, the agency used the Community Viz software program to ask the public to describe their vision for regional growth in a charrette style workshop. There were about 175 stakeholder participants in the workshops, divided into groups addressing the 8 goal areas. Feedback from this workshop helped inform the goals and approaches developed in the plan.

COMPASS uses benchmarking to calculate projections of the anticipated impacts of investments. The agency looks at how these types of projects typically perform in a certain area and applies that assumption to the region. Recently, they have started to improve safety data collection to provide crash rates instead of absolute numbers.

In addition, the performance-driven approach prompted a change in the MPO's data collection activities. The MPO had data on vehicle traffic, but little data on bicyclist/pedestrian activity, so the agency installed permanent bicyclist and pedestrian traffic counters in key locations, plus portable counters that they rotate through the area to get a better sense of actual ridership.

COMPASS shares a building with Valley Regional Transit, which has been very helpful for coordination. The MPO has one dedicated staff member for public transit planning, who works closely with Valley Regional Transit staff. Valley Regional Transit also participates on the MPO Board, as well as all workgroups and committees. Their planners provide helpful suggestions for designing more transit-friendly projects.

For the TIP, the MPO's public involvement person helped tell the performance story by putting together features such as the "In A Nutshell" page, which provides an infographic summary of highlights of the TIP, including its relationship to performance. COMPASS also developed a performance dashboard to allow the public and other stakeholders to view performance data in different ways.

COMPASS created a review checklist to assist cities in the Boise and Nampa, Idaho region in assessing the transportation impacts of proposed new development projects. COMPASS also included connectivity and walking distance performance measures to help them understand tangible ways in which their land use decisions can help to curb sprawl. In addition to the checklist, they provide Communities in Motion implementation grants, which are modeled after the **Atlanta Regional Commission's** Livable Centers Initiative. The projects are small scale, with about $100,000 total in grant funds. COMPASS can fund about a dozen projects per cycle, typically for projects in downtown areas, major activity centers, and multimodal pathways to support integrated land use and transportation projects.

Small MPOs

Small MPOs are defined here as those serving a population of fewer than 200,000.

Fairbanks Area Surface Transportation Planning[182]

Fairbanks Area Surface Transportation Planning Highlights

- FAST Planning uses a weighted screening criteria list to identify the highest priority projects.

The **Fairbanks Area Surface Transportation Planning (FAST Planning)**, the MPO for the Fairbanks, Alaska metropolitan area, develops their TIP immediately after the adoption of the MTP. For the 2018 update to the MTP, the MPO took the list of projects from the previous plan and public involvement process, existing projects, and new projects, and used a technical committee to score all of them using weighted screening criteria. There were around 80 projects reviewed in total.

Project scoring for the MTP project list consists of a one-page screening criteria list, which includes (but is not limited to) safety, connectivity, air quality, existence in the current plan, land use, daily traffic, pavement condition, sidewalk condition (beyond Americans with Disabilities Act compliance), and daily bicyclist/pedestrian count. Safety is the highest weighted category in both the MTP and TIP. FAST Planning has robust data for system conditions, which are helpful in scoring projects objectively and consistently.

The agency sorts the highest scoring projects into the short-range category and moves the lower scoring projects to the long-range category or removes them from consideration entirely. In addition to this scoring process, FAST Planning did several scenario planning exercises with the public, after which there was a heightened focus on the rapidly growing areas. The scenario planning process was highly transparent, which was well received by the public.

FAST Planning organizes projects into short-, medium-, and long-term categories in the MTP. For the TIP, the MPO asks local governments and agencies to look at the short-range list and nominate

projects for inclusion. Local governments are required to make a commitment for a funding match for any nominated projects. At least 80 percent of the projects in the TIP come from the short-term list identified in the MTP.

The TIP screening criteria are more extensive than the MTP criteria and include a 14-page nomination form. All projects are evaluated and scored on the following weighted performance topics: safety, public support, maintenance and operations, system preservation, connectivity, environmental mitigation, project readiness, and land use. Road projects and multimodal project categories have additional criteria, respective to those categories.

Rockingham Planning Commission[183]

The **Rockingham Planning Commission** is the MPO for the Rockingham County, New Hampshire metropolitan area. The agency uses performance data in the project selection process for the MTP. All of the MPOs in New Hampshire score projects for submission into the MTP using a common set of criteria; however, each MPO applies weights to those criteria in order to reflect local priorities. The Rockingham Planning Commission also sorts projects into three categories, based on the size of the project, to compare similarly sized projects.[184]

Rockingham Planning Commission Highlights

- Performance data helped the agency quantify and compare perceived challenges.
- The Rockingham Planning Commission partnered with local agencies to purchase a dataset and data tools.

In 2019, the MPO used travel-time data from the National Performance Management Research Data Set to help community and elected officials put the level of congestion they are experiencing into perspective, comparing observed minutes of delay with the publics' perception of congestion. For example, while the queues were perceived to be long at a particular intersection, delay was averaging only around 37 seconds compared with free flow. Communicating performance data and analysis helped the MPO work with local governments and decision-makers to reassess priorities.[185]

The Rockingham Planning Commission also categorized projects in the TIP System Performance Report based on whether they would be expected to have a benefit on a given performance target.[186]

The Rockingham Planning Commission also has directed more resources to performance-based planning activities in the Unified Planning Work Program (UPWP). As an example, the MPO partnered with local agencies to purchase an extended dataset and tools from RITIS and INRIX for all State highways in New Hampshire to use in planning studies. The shared cost made the price manageable for each agency.[187]

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Conclusion

Performance-based activities and strategies can enable transportation planning agencies to implement strategic, data-driven approaches to inform transportation investment and policy decisions and achieve performance goals. Performance-based planning and programming (PBPP) practices are becoming more effective as they mature and become institutionalized at the State departments of transportation (DOTs) and metropolitan planning organizations (MPOs). PBPP seems to be most effective at agencies that see the value of engaging in performance-based approaches.

Potential Benefits of PBPP

Such agencies recognize that PBPP can help them:

- Optimize their investment decisions so that public funds are spent in ways that improve performance cost-effectively.
- Improve consistency in the agencies' internal decision-making processes and as a way to compare with their peers.
- Increase coordination among the many agencies and stakeholders that have an impact on the performance of the transportation system.
- Increase their understanding of which investments are likely to improve performance.
- Communicate to the public and stakeholders the value and benefits that come from making investments informed by data analysis, among other inputs.

How PBPP Helps the State DOTs and MPOs Achieve the Potential Benefits of Transportation Performance Management

PBPP provides tools to assess performance across several goal areas and develop a path to improve that performance. Most of the agencies interviewed in this study found that PBPP equipped them with better methods to make decisions and evidence to support and communicate those decisions. PBPP brings a level of objectivity to planning and decision-making processes; however, qualitative analyses and committee discussions still play important roles in investment decisions.

Performance measures allow agencies to directly link investment strategies and project lists to agency goals and objectives. Federally-required performance measures address widely used topics, such as safety and congestion, and many agencies use additional performance measures that address locally determined priorities, such as equity, climate change, or active transportation.

Communicating the performance of the transportation system or specific performance areas, especially in relation to targets or trends, often helps agencies influence programming decisions, achieve support among the public or decision-makers, and, in some instances, has aided in procurement of additional funding to address performance.

Agencies also can use performance to guide Unified Planning Work Programs (UPWPs) and State Planning and Research (SPR) Work Programs as a way to focus agency activities specifically on working toward certain goals or priorities.

The Federal requirement to coordinate when establishing performance targets[34] has helped agencies improve coordination with one another regarding the need to share data and priorities.

Areas for Improvement in the State of the Practice

Effective PBPP practices were found at every stage in planning and programming at State DOTs and MPOs nationwide, and all agencies are continuing to learn and refine their practices. The ideas throughout this report can be used to develop new performance-based practices or incorporate performance into established practices. Chapter 2 describes options and examples of how to use data to influence and enhance decisions throughout the planning and programming process. Chapter 3 provides more extensive examples from State DOTs and MPOs of various sizes (which often correlate with technical capacity). Staff at State DOTs and MPOs also may benefit from additional resources, tools, and skills for the following areas:

- Using performance measures to monitor progress toward agency goals.
- Analyzing previous projects and forecasting the impacts of future investments.
- Integrating performance into investment decisions through project evaluation criteria, prioritization processes, and scenario planning.
- Collaborating internally and externally to align performance-based planning.
- Communicating with decision-makers, stakeholders, and the public.

Sample of Existing USDOT PBPP and TPM Resources

- FHWA TPM FAQs
- FHWA TPM Guidance Resources
- FHWA PBPP Implementation Roadmap for FHWA Divisions
- FHWA PBPP Guidebook
- FHWA Model Plan Guidebook
- FTA PBPP Resources
- FTA Transit Asset Management FAQs
- FTA Transit Asset Management Fact Sheet
- FTA Transit Asset Management Resources
- FTA Public Transportation Agency Safety Plan Fact Sheet
- FTA Public Transportation Agency Safety Plan Resources

Using Performance Measures to Monitor Progress Toward Agency Goals

Many State DOT and MPO agencies use performance measures to guide their policy and investment decisions and monitor progress toward their agency's goals and objectives. As the PBPP state of the practice continues to evolve, agency practices involving the Federal measures can serve as examples for non-Federal measures, and vice versa. Appendix D categorizes a variety of performance measures that agencies have used to measure performance in areas not addressed by the Federal measures. Based on the peer exchanges and variability in the non-Federal performance measures used for each of these performance areas, it seems that each agency is conducting its own research and using its own approach. Noteworthy

[34] 23 CFR 450.206(c)(2) and (c)(3) and 23 CFR 450.306(d)(2).

practices involving interagency coordination, goal setting, data sharing and analysis, target establishment, performance monitoring, and reporting could help State DOTs and MPOs improve their use of Federal and non-Federal performance measures.

Analyzing Previous Projects and Forecasting the Impacts of Future Investments

State DOTs and MPOs can proactively use performance data to analyze how previous projects have influenced performance and predict how proposed projects could impact future performance, which can help inform investment decisions going forward. Some agencies have begun to conduct analysis at this level; however, it is not widely practiced at this time. Although transportation plans and programs are beginning to identify which projects support performance targets, they typically provide little or no documentation regarding how or why agencies concluded that those projects will support the targets. It is often unclear in planning documents how they have conducted supporting analysis of the potential impact on performance. One of the challenges in analyzing performance is that many agencies are more experienced with using performance measures for tracking progress than for forecasting or anticipating how today's decisions will impact tomorrow's performance data. With the short timeframes of the Federal targets, agencies are interested in better understanding the causal factors that influence the year-to-year changes in performance. The Federal TAMP requirements in 23 CFR Part 515 can help State DOTs and MPOs address some of these analytical challenges for the NHS pavement and bridge condition performance measures, as well as for other assets a State DOT may choose to include in its TAMP.

Integrating Performance into Investment Decisions Through Project Evaluation Criteria, Prioritization Processes, and Scenario Planning

Many State DOTs and MPOs are primarily using performance data for tracking current conditions rather than as an input into decision-making processes. As agencies continue to advance their understanding of PBPP, they have the ability to more proactively influence investment decisions through project evaluation criteria, prioritization processes, and scenario planning activities focused on performance. In the peer exchanges, agencies confirmed that they are finding it challenging to realign their institutional processes to enable the consideration of performance data when making decisions. Many agencies are dealing with "legacy projects" from previous programming that were not selected based on performance considerations. Any newly programmed projects might be selected based on performance metrics; however, they are not likely to be implemented in time to impact current targets. One of the challenges in using performance data to influence decisions is that many State DOTs and MPOs report that they have limited authority over project selection decisions. Instead, projects are often selected by elected officials or by local jurisdictions (e.g., counties). This study did find examples of agencies using performance data to influence the investments of other agencies, and broader use of these approaches could be sufficient to overcome this challenge. At least one agency in this study indicated that performance data were used to influence funding decisions at the State legislature; however, this appears to be a rare occurrence.

Collaborating Internally and Externally to Align Performance-Based Planning

PBPP has prompted greater coordination for transportation agencies; however, there are still opportunities for State DOTs and MPOs to strengthen internal and external coordination efforts, especially with Federally-required performance-based plans (e.g., Strategic Highway Safety Plans [SHSPs], State Transportation Asset Management Plans [TAMPs], State freight plans, and Transit Asset Management [TAM] Plans). Coordinating performance-based plans can help align priorities among modes and functional areas to better coordinate joint efforts, initiatives, and investments to improve transportation system performance. While many of these performance-based plans are new, there are already signs that long-range plans, STIPs, and TIPs are being influenced by the earliest developed performance-based plans. According to the online scan conducted in this study, the State TAMP was the most likely of all the plans to have a documented influence on State DOT and MPO long-range plans, followed by the SHSP and the Highway Safety Improvement Program (HSIP.

One of the challenges with performance-based planning is State DOT and MPO coordination with public transit providers. The researchers' review of long-range plans found that many plans listed transit operators on the lists of stakeholders; however, there was little or no documentation regarding how the transit operator was involved in long-range plan development or how agencies were working together to improve performance. When speaking with PBPP staff at State DOTs and MPOs, these staff members often reported having little or no knowledge of transit-related activities at their agency. This may be because public transit providers have competing priorities and limited availability for engaging closely with the planning activities of other agencies. Sharing data across agencies will likely improve performance-based planning for State DOTs, MPOs, and public transit providers.

Communicating with Decision-Makers, Stakeholders, and the Public

The sharing and reporting of performance-related data and information provide opportunities for State DOTs and MPOs to enhance coordination with decision-makers, stakeholders, and the public. Strengthening communication channels can help agencies better understand transportation needs and interests, and reinforce support for performance goals, targets, and investment decisions. Communicating transportation system performance can take different forms, including static performance reports, interactive options such as public presentations and workshops, and online tools and dashboards. The most effective communication tools and messages accommodate both technical and non-technical audiences and include a range of educational, informational, and analytical efforts. Well-organized and easily accessible communication formats are important for keeping decision-makers, stakeholders, and the public continuously engaged in the planning and decision-making processes.

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Appendix B. Acknowledgments

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Appendix C. Methodology

Overview of the Methodology

Agency Selection

The study team completed an online scan of 85 metropolitan planning organizations (MPO) and 52 State department of transportation (DOT) long-range planning and transportation improvement documents (i.e., long-range statewide transportation plan [LRSTP]/metropolitan transportation plans [MTPs] and statewide and metropolitan transportation improvement programs [STIPs/TIPs]). In selecting the MPO sample, the team sought a representative sample that would support an assessment of the state of the practice, rather than focusing on MPOs that are known to have noteworthy practices. The representative sample generally included one or two MPOs per State and 10 multi-State MPOs; the sample also was balanced among other characteristics, such as population size, Federal Transit Administration (FTA) Region, and whether the MPO was known to be a transit provider (17 MPOs) or have transit providers with voting representation on the MPO Boards (16 MPOs).

Online Scan Tool Development

The study team worked with the Federal Highway Administration (FHWA) and FTA to develop a list of questions to guide the online review process. These questions were informed by the project's objectives, FHWA's five key outcomes for national transportation performance management (TPM) implementation, input from FHWA and FTA, and FHWA's Performance-Based Planning and Programming Guidebook. These resources enabled researchers to retrieve high-level information on the current integration level of performance-based planning and programming (PBPP) practices into the planning process, products, and outcomes; allow for a comparison of current practice with that recommended by FHWA and FTA; and enable the identification of information gaps to explore.

Building on the feedback from FHWA and FTA, the study team refined the questions further after an initial test round of research using the data collection tool. This test round was an initial scan performed by members of the research team to identify potential hurdles to efficient data collection and ensure that the tool obtained consistent results before engaging in the full scan.

The final list of questions can be reviewed below in the section Questions from the Data Collection Tool for the Online Scan.

Online Scan

Once the data collection tool was finalized, the study team completed the full online scan of all the selected MPO and State DOT planning documents. The data collected for each question were analyzed using simple statistics to report high-level findings.

Further analysis was completed through a review of the Unified Planning Work Program (UPWP) and the State Planning and Research (SPR) Work Programs, a survey of FHWA Divisions and FTA Regions, interviews, and virtual peer exchanges.

UPWP and SPR Work Program Review

Forty-one of the 85 MPOs used for the online scan were selected for a UPWP Table of Contents (TOC) review. Count formulae and conditional formatting were used to ensure that MPOs still represented a diverse group of areas. Ten SPR Work Programs were selected for a TOC review based on an online search for DOTs with clearly documented SPR funding. After the TOC review, all 10 State DOT SPR Work Programs and 12 MPO UPWPs were selected to be reviewed in-depth for examples of investments and activities related to selected performance topics.

Survey of FHWA Divisions and FTA Regions

All 52 FHWA Divisions and 10 FTA Regions were sent a survey with four questions requesting examples regarding PBPP practices among agencies in their respective States and Regions. All 52 FHWA Divisions and 3 FTA Regions completed the survey and provided useful examples and insights.

- Q1. Based on your experience, please provide examples of the following at your State DOT(s) and/or MPOs. Please provide 1–2 examples of how PBPP has influenced your State DOT(s) or MPOs to change their processes for selecting investments.
- Q2. Based on your experience, please provide examples of the following at your State DOT(s) and/or MPOs. Please provide 1–2 examples of how your State DOT(s) or MPOs have coordinated with transit agencies in a way that influenced the investment decisions of the DOT or MPO.
- Q3. Based on your experience, please provide examples of the following at your State DOT(s) and/or MPOs. Please provide 1–2 examples of the types of investments or activities your State DOT(s) or MPOs have used to address PBPP in their transportation improvement programs, long-range plans, or work programs.
- Q4. Based on your experience, please provide examples of the following at your State DOT(s) and/or MPOs. Please provide 1–2 examples of how your State DOT(s) or MPOs were able to use PBPP to improve its communications with stakeholders and/or streamline project delivery.

Interviews and Peer Exchanges

Nine interviews (six MPOs and three State DOTs) and six virtual peer exchanges (four MPO groups and two State DOT groups) have been completed. Agencies with noteworthy practices to follow up on from previous research were selected for interviews. A mix of agencies identified as having potentially noteworthy or mature practices, or those in the process of establishing strong PBPP activities were selected for virtual peer exchanges. The MPO peer exchanges were organized into four groups: small MPOs, mid-sized MPOs, large MPOs, and multi-State MPOs. The DOT peer exchanges were split into two groups: DOTs with LRSTPs pre-2018 and DOTs with LRSTPs post-2018.

For each interview, tailored questions were prepared based on the follow-up items from previous research and sent to the interviewees in advance. For the virtual peer exchanges, a participant agenda was sent in advance to the agency members invited. The exchanges were conducted using Adobe Connect and included a PowerPoint presentation and interactive discussion topics. The six virtual peer exchanges had similar formats and agendas and were designed for the peers to share

their perspectives on how their agencies address communications, long-range planning, programming, planning work programs, and interagency coordination.

Questions from the Data Collection Tool for the Online Scan

- Q1. Name of the agency?
- Q2. Is this agency a State DOT or MPO?
- Q3. What are the official title and URL of the most recently completed STIP/TIP and LRSTP/MTP (including date of adoption)?
- Q4. Describe the structure of the documents listed in the previous question. Are there separate modal plans?
- Q5. Does the agency publish a report about system conditions with respect to performance targets?
  - » Yes, online performance dashboard
  - » Yes, stand-alone PDF report such as the “state of the system”
  - » Yes, in chapter in LRSTP/MTP
  - » Yes, other (if this is selected, explain in the comment box)
  - » No/Unclear
- Q6. Do the documents reference how the agencies have worked with transit agencies to improve performance?
  - » Yes/No/Unclear checkbox options for STIP/TIP and LRSTP/MTP
- Q7. To what extent did the STIP/TIP appear to be influenced by the following plans: Highway Safety Improvement Program (HSIP), State Highway Safety Plan (SHSP), State freight plan, State asset management plan for NHS, Public transportation agency safety plan, Transit asset management plan, CMAQ performance plan, and the congestion management process (CMP)? Checkbox options for each plan include:
  - » Incorporates performance targets established in the other plan.
  - » Incorporates performance measures established in the other plan.
  - » Influences in another manner, such as the goals or objectives.
  - » Contains only a statement referencing the other plan.
  - » Unclear/Not included in the plan.
- Q8. To what extent did the LRSTP/MTP appear to be influenced by the listed plans: HSIP, SHSP, State freight plan, State asset management plan for NHS, public transportation agency safety plan, transit asset management plan, CMAQ performance plan, and CMP? Checkbox options for each plan include:
  - » Incorporates performance targets established in the other plan.
  - » Incorporates performance measures established in the other plan.
  - » Influences in another manner, such as the goals or objectives.
  - » Contains only a statement referencing the other plan.
  - » Unclear/Not included in the plan.
- Q9. Are the federally-required performance measures and targets included?

  - » Checkbox columns for STIP/TIP and LRSTP/MTP for each federally-required performance measure:
    - – Number of fatalities
    - – Rate of fatalities
    - – Number of serious injuries
    - – Rate of serious injuries
    - – Number of nonmotorized fatalities and serious injuries
    - – Percentage of pavements of the Interstate System in Good condition
    - – Percentage of pavements of the Interstate System in Poor condition
    - – Percentage of pavements of the non-Interstate NHS in Good condition
    - – Percentage of pavements of the non-Interstate NHS in Poor condition
    - – Percentage of NHS bridges classified as in Good condition
    - – Percentage of NHS bridges classified as in Poor condition
    - – Percentage of person-miles traveled on the Interstate that are reliable
    - – Percentage of person-miles traveled on the non-Interstate NHS that are reliable
    - – Interstate Highway Truck Travel Time Reliability (TTTR) Index
    - – Annual hours of peak hour excessive delay per capita
    - – Percentage of non-single occupancy vehicle (SOV) travel
    - – Emissions reductions for particulate matter 2.5 (PM2.5) through CMAQ projects
    - – Emissions reductions for particulate matter 10 (PM10) through CMAQ projects
    - – Emissions reductions for nitrogen oxides (NOx) through CMAQ projects
    - – Emissions reductions for carbon monoxide (CO) through CMAQ projects
    - – Emissions reductions for volatile organic compounds (VOCs) through CMAQ projects
    - – Transit rolling stock (percentage of revenue vehicles within a particular asset class that have either met or exceeded their useful life benchmark)
    - – Transit equipment (percentage of non-revenue service vehicles that have either met or exceeded their useful life benchmark)
    - – Transit facilities (percentage of facilities within an asset class, rated below condition 3 on the Transit Economic Requirements Model scale)
    - – Transit infrastructure (percentage of track segments with performance restrictions)

- Q10. Beyond the federally-required performance measures, does the STIP/TIP include other performance goals and/or targets?
  - » Checkbox columns for “quantitatively” and “qualitatively” for the following topics:
    - – Social equity, environmental justice, health, etc.
    - – Security
    - – Economic development
    - – Climate/Resiliency
    - – Partnerships or coordination with other entities
    - – Land use linkages
    - – Finance
    - – Customer service
    - – Transit performance and service
    - – Energy or water conservation
    - – Public involvement/participation/engagement/outreach

- Q11. Beyond the federally-required performance measures, does the LRSTP/MTP include other performance goals and/or targets?
  - » Checkbox columns for “quantitatively” and “qualitatively” for the following topics:
    - – Social equity, environmental justice, health, etc.
    - – Security
    - – Economic development
    - – Climate/Resiliency
    - – Partnerships or coordination with other entities
    - – Land use linkages
    - – Finance
    - – Customer service
    - – Transit performance and service
    - – Energy or water conservation
    - – Public involvement/participation/engagement/outreach
- Q12. Do the documents show that the agency used project selection criteria to support screening or prioritization of projects or strategies?
  - » Yes/No/Unclear checkbox options for STIP/TIP and LRSTP/MTP
- Q13. If the answer to the previous question is Yes: How mature is their approach? (checkbox columns for STIP/TIP and LRSTP/MTP)
  - » Projects are prioritized using a quantifiable score for at least one performance measure.
  - » Performance goals are considered generally when discussing prioritization.
  - » Performance goals are not used for prioritization.
- Q14. If they had quantitative project selection criteria, what kinds of performance areas did they apply to? (checkbox columns for STIP/TIP and LRSTP/MTP)
  - » Safety
  - » Pavement condition, maintenance, or preservation
  - » Bridge condition, maintenance, or preservation
  - » Congestion, delay, and travel reliability
  - » Air pollution and emissions
  - » Transit asset condition
  - » Social equity, environmental justice, health, etc.
  - » Security
  - » Economic development
  - » Climate/Resiliency
  - » Partnership or coordination with other entities
  - » Land use linkages
  - » Finance
  - » Customer service
  - » Transit performance and service
  - » Energy or water conservation
  - » Public involvement/participation/engagement/outreach

- Q15. Does the document contain any forecasts of anticipated effects of proposed investments on performance?
  - » Yes/No/Unclear checkbox options for STIP/TIP and LRSTP/MTP
- Q16. Has the agency compared the anticipated impacts of different investment scenarios on performance?
  - » Yes/No/Unclear checkbox options for STIP/TIP and LRSTP/MTP
- Q17. To what extent do the documents discuss that they were influenced by the anticipated effects of proposed investments (individual projects and/or aggregated categories of investment programs) on performance? (checkbox columns for STIP/TIP and LRSTP/MTP)
  - » Yes, provides quantitative analysis to support the discussion
  - » Yes, includes some explanation for how proposed investments will meet the goals (non-quantitative)
  - » Yes, includes a brief statement
  - » No/Unclear
- Q18. Does the LRSTP/MTP discuss the effectiveness of previous investments on system performance?
  - » Yes, using quantitative analysis or evidence
  - » Yes, using qualitative reasoning
  - » No/Unclear
- Q19. Does the STIP/TIP discuss the effectiveness of previous investments on system performance?
  - » Yes, using quantitative analysis or evidence
  - » Yes, using qualitative reasoning
  - » No/Unclear
- Q20. Do the documents reviewed describe any additional research programs or activities related to performance measures or targets?
  - » Data collection/analysis/modeling/forecasting related to performance measures or targets
  - » Investment scenarios/cost-benefit/tradeoff analysis related to performance measures or targets
  - » Interagency groups or partners working with performance measures or targets
  - » Communication to stakeholders/public/decision-makers related to performance measures and targets
  - » Other (please specify)

Appendix D. Performance Measures Beyond Federal Requirements

The following tables include examples of performance measures beyond the federally required measures and were found in the long-range plans for the agencies, as listed in Appendix A. Bibliography. Agencies voluntarily selected these measures to meet their own objectives.

Accessibility

Many measures are related to access to transportation, such as transit services, access to jobs, or access to essential services, such as housing, education, health care, healthy food, recreation, and social services.

Table 6. Performance measures for accessibility.

Performance Area	Measures Used
Accessibility	▪ Percentage of people living within 0.75 mile of a transit stop (MORPC) ▪ Percentage of transit accessible to disadvantaged communities (SANDAG) ▪ Increase in the percentage of households from equity focus areas with access to mid-wage jobs, parks and open space, high-capacity transit stations, and community places (Portland Metro) ▪ Average number of jobs reachable within 20 minutes via automobile and within 40 minutes via transit (MORPC) ▪ Percentage of work and higher education trips accessible within 30 minutes during peak periods by transit (SANDAG) ▪ Percentage of jobs within 0.5 mile of frequent transit service (Coastal Region MPO) ▪ Percentage of work trips accessible within 30 minutes during peak periods by transit for low-income communities, minority communities (SANDAG) ▪ Percentage of jobs within a 0.25-mile walking distance from an existing pedestrian facility (The Forks MPO)

Active Transportation

Many agencies, primarily metropolitan planning organizations (MPOs), included additional performance measures in their long-range plan related to active transportation, and some set targets for those measures. **Active transportation measures and targets often focus on mode share, connectivity, and facility completion.**

- The **Pima Association of Governments (PAG)**, the MPO for the Tucson, Arizona region, for example, sets targets for walking, biking, and transit commute mode share; mileage of bicyclist and pedestrian facilities; relevant safety measures; and many other related targets.
- **The Mid-Ohio Regional Planning Commission (MORPC)**, in Columbus, Ohio, also included several active transportation targets to support its Sustainable Neighborhoods and Health, Safety, and Welfare goals. These targets include 830 miles of bikeways, 85 percent of arterials

and collectors with sidewalks, and 100 percent of member communities adopting complete street policies by 2040.[188]

- The **District Department of Transportation (DOT)**, in Washington, DC, is one of the few State DOTs to set long-range active transportation goals; it intends to achieve 75 percent of all commuter trips in the District via non-auto modes by 2030.[189]

Table 7. Performance measures for active transportation.

Performance Area	Measures Used
Active transportation	▪ Miles of bicyclist/pedestrian facilities (Madison Area TPB) ▪ Utilization rates of the electric bike share program (Madison Area TPB) ▪ Active Living Index scores (Madison Area TPB) ▪ Key corridor and project bicyclist and pedestrian volumes (pre- and post-project) (Casper MPO) ▪ Percentage of arterials and collectors with sidewalks (MORPC) ▪ Percentage of member communities adopting complete street policies by 2040 (MORPC)

Congestion and Reliability

In addition to Federal requirements for measuring congestion and reliability, some agencies developed other measures and targets. For example, the **Maine DOT**'s LRSTP includes a specific target: "to reduce delay for highway users caused by congestion by 9.3 percent to 30 hours per 10,000 vehicle-miles traveled by 2030."

Table 8. Performance measures for congestion and reliability.

Performance Area	Measures Used
Congestion and reliability	▪ Commercial vehicle delay cost (ARC) ▪ Average speed during morning/evening peak of general purpose/managed lanes (ARC) ▪ Average commute travel time in minutes by personal vehicle (ARC) ▪ Total surface transportation congestion cost per person (ARC) ▪ Per capita delay on the Regional Freight Network (MTC) ▪ Average travel time (SANDAG) ▪ Morning and evening peak region-wide uncertainty index (MORPC) ▪ Annual hours of truck/auto delays (PennDOT)

Environmental Sustainability and Resiliency

Many plans included performance measures related to the environment, including GHG emissions, air quality, use of sustainable travel modes, or use of alternative fuel vehicles.

- **Delaware Valley Regional Planning Commission (DVRPC)**, the MPO for the Philadelphia, Pennsylvania area, is an example of an agency with an energy-reduction goal: to develop a more

energy-efficient economy. DVRPC also considers energy in its "what-if scenario projections" for 2045. It predicts average annual household residential energy costs for each scenario. One of the scenarios is the "U.S. Energy Boom." One of DVRPC's key goals is to reduce greenhouse gas (GHG) emissions. The quantitative target—a 60 percent reduction in GHG emissions from 2005 levels by 2040—supports the City of Philadelphia's target to reduce GHG emissions by 80 percent by 2040.

- The **New York State DOT and New Mexico DOT** also forecast future energy trends to evaluate transportation needs.

Other plans included measures related to water quality, stormwater management, and flooding.

- The **Des Moines Area MPO**, in Iowa, has an environmental resiliency section in its MTP, which suggests policies to improve watershed and stormwater management.[190]
- The **Wilmington Area Planning Council (WILMAPCO)**, the MPO for the Wilmington region in Delaware and Maryland, has a goal of planning for energy security and resilience. The MPO has a goal of adapting to sea level rise, storm flooding, and other environmental challenges.[191]

Table 9. Performance measures for environmental sustainability and resiliency to natural hazards.

Performance Area	Measures Used
Emissions, vehicle-miles traveled (VMT), and related measures	▪ Percentage of commuters driving alone (MORPC and Rhode Island State Planning Council) ▪ Percentage of commuters riding transit, bicycling, or walking (MORPC) ▪ VMT per capita (MORPC) ▪ Number of public electric vehicle charging stations (WILMAPCO) ▪ Percentage of low-emissions projects (Coastal Region MPO) ▪ Gallons of gasoline purchased (Rhode Island State Planning Council) ▪ GHG emissions (Rhode Island State Planning Council)
Water quality, stormwater management, and flooding	▪ Flood zone risk status (Coastal Region MPO) ▪ Number of funded TIP projects potentially impacted by sea level rise (WILMAPCO)
Sustainable design	▪ Percentage of green infrastructure and/or low-impact development installation (Coastal Region MPO) ▪ Number of projects that incorporate sustainable design elements (Santa Fe MPO)

Equity and Health

Equity and public health goals and measures often focus on access to services, affordability, and health. Some agencies had population-wide measures, while others measured outcomes for specific subsets of the population (e.g., low-income, minority) or mapped out disadvantaged/priority areas. In addition to performance measures for equity and health, some agencies have established targets, such as:

- The **New York Metropolitan Transportation Commission**, the MPO for the New York City region, set targets to accommodate regional growth without displacing current low-income residents and increasing the share of affordable housing in priority areas by 15 percent.[192]
- **MORPC** has targets for the percentage of arterials and collectors with sidewalks, percentage of the population living within 0.75 mile of a transit stop, and the percentage of the population living within 0.75 mile of a bikeway.[193]

Table 10. Performance measures for equity and health.

Performance Area	Measures Used
Access to essential services	▪ Share of low- and moderate-income renter households in priority development areas, transit priority areas, or high-opportunity areas that are at risk of displacement (MTC) ▪ Number of projects within 1 mile of a healthy food source (Casper MPO) ▪ Share of affordable housing in priority development areas, transit priority areas, or high-opportunity areas (MTC) ▪ Percentage of environment justice (EJ) populations with adequate access to employment centers (Ohio DOT) ▪ Percentage of the population (low-income, low-mobility, and minority) within 15 minutes of health care (SANDAG)
Accessibility of transportation options	▪ Percentage of Family Independence Program recipients residing within 0.25 mile of a fixed transit route (Rhode Island State Planning Council) ▪ Percentage of homes within 0.5 mile of a transit stop for low-income and minority communities (SANDAG) ▪ Mode choice in census tracts with high concentrations of EJ populations (ARC)
Affordability of housing and transportation	▪ Share of lower income residents' household income consumed by transportation and housing (MTC) ▪ Percentage of households that spend more than 45 percent of their income on housing and transportation (Hattiesburg-Petal-Forrest-Lamar MPO)
Health	▪ Percentage of projects incorporating Americans with Disabilities Act-compliant features (Casper MPO) ▪ Health incidents related to air quality (Regional Transportation Commission of Southern Nevada)

Finance

Financial goals and measures were included in some long-range plans, primarily among the State DOTs and MPOs with populations greater than 1 million.

- The **New Hampshire DOT's** Long-Range Statewide Transportation Plan (LRSTP) has eight key goals, one of which is "stewardship of public resources and the transportation system." Objectives for meeting that goal include "expand the use of innovative finance to deliver more and better projects faster" and "diversify and maintain the buying power of funding sources used to fund 10-Year Plan projects."
- **Texas DOT's** LRSTP includes a goal of "[facilitating] the development and exchange of comprehensive multimodal transportation funding strategies with transportation program and project partners."

Table 11. Performance measures for finance.

Performance Area	Measures Used
Finance	▪ Dollars generated plus dollars deferred by cost-sharing agreements, partnerships, context-sensitive solutions approach, and impact fees/off-site improvements (New Hampshire DOT) ▪ Percentage of projects and programs using alternative financing (Texas DOT) ▪ Percentage of funding from non-public sources on transportation projects (MORPC)

Freight

Some agencies included freight-specific goals, objectives, and measures; while many of these focus on system reliability, they go beyond the Federal measure related to Interstate truck travel-time reliability.

- The **Virginia Office of Intermodal Planning and Investment (OIPI)** has objectives to reduce the severity and number of freight bottlenecks, and improve reliability on key corridors.
- The **Kentucky Transportation Cabinet** has the goal of providing a dependable transportation system that effectively and efficiently moves people and freight.[194]
- The **Kentuckiana Regional Planning and Development Agency (KIPDA)** set targets related to freight movement goals. One target is to maintain or improve roadways on the Highway Freight Network that are Level of Service D or worse.[195]

Table 12. Performance measures for freight.

Performance Area	Measures Used
Freight	▪ Percentage/number of freight bottlenecks eliminated (PennDOT) ▪ Percentage of growth in jobs in freight-intensive industries (Indiana DOT) ▪ Percentage of growth in export value (Indiana DOT) ▪ Roadways on the freight network that are below a certain level of service (KIPDA) ▪ Number of locations on the freight network within 1 mile of freight clusters where roadway geometry and/or restrictions impede freight movement (KIPDA) ▪ Average truck speed on freight corridors during the evening commute (Wasatch Front Regional Council)

Land Use Linkages

While coordinating land use and transportation is a strategy to support various goals related to accessibility and economic development, linking land use and transportation also has been identified as a goal or objective in some plans. When discussed as a goal or objective, land use transportation linkages are often tied to priorities related to economic development, connected communities, complete streets, green spaces, affordable housing, transit, alternative modes, and/or freight.

- The **New Mexico DOT** includes land use goals, strategies, and performance measures in its LRSTP. The goal "provide multimodal access and connectivity for community prosperity" is supported by strategies that include land use transportation coordination, strategic investment in key corridors, prioritizing operations and demand management over capacity expansion, and responding to changing demographics.[196]
- The **Rhode Island DOT** LRSTP includes targets such as an "urbanized area is to increase no more than the rate of population growth."

Some agencies described integrated transportation and land use decisions as part of the vision, along with associated strategies. The **DVRPC** Metropolitan Transportation Plan (MTP), for example, includes a detailed Land Use Vision, as well as a detailed section on developing livable communities. The Land Use Vision divides the region into four "layers": infill and redevelopment areas, emerging growth areas, rural resource lands, and a Greenspace Network. It also identifies centers where new development should be focused. MTP goals include preserving open space, investing in centers, and preserving cultural landscapes.

Table 13. Performance measures for land use linkages.

Performance Area	Measures Used
Land use linkages	▪ Total acreage of industrial zoned land on riverfront/rail access (Metropolitan Council) ▪ Number of municipal officials trained through the Local Technical Assistance Program on the coordination of land use and transportation planning (PennDOT) ▪ Acreage of farmland and open space converted to development (Wasatch Front Regional Council) ▪ Transit ridership among the activity centers (ARC) ▪ Ratio of urban area growth rate to population growth rate (Rhode Island State Planning Council)

Public Engagement and Satisfaction

Public involvement is an important part of the statewide and metropolitan transportation planning processes. While public involvement is not a transportation system outcome, the online scan for this study found some agencies using measures for public engagement and media engagement, as well as measures of customer service satisfaction associated with the transportation agency, summarized in Table 14.

A few agencies even set targets related to customer service and satisfaction with the transportation agency. As part of its performance management program, the **Missouri DOT** tracks progress in relation to a set of seven tangible results via its Tracker quarterly report. While these tangible results include system performance measures, they also include measures related to customer satisfaction. For example, the Missouri DOT set its customer satisfaction target to be 86 percent in 2019, based on the American Customer Service Index, which releases a cross-industry list of customer satisfaction scores annually. The agency also sets targets on the "percentage of customers who feel the Missouri DOT provides timely information" (96 percent), "percentage of customers who feel the Missouri DOT provides accurate information" (96 percent), and "percentage of customers who feel the Missouri DOT provides understandable information" (96 percent). The Missouri LRSTP shows how the plan goals and objectives are aligned with the Missouri DOT's seven tangible results and links the tangible result of "Provide Outstanding Customer Service" with the plan's goal of "[Giving] Missourians better transportation choices."

Table 14. Performance measures for public engagement and satisfaction.

Performance Area	Measures Used
Public engagement and satisfaction	▪ Web hits (WILMAPCO) ▪ E-news subscribers (WILMAPCO) ▪ Number of followers for the agency Facebook page (WILMAPCO) ▪ Racial/Ethnic background of the Public Advisory Committee (WILMAPCO) ▪ Public opinion survey to determine whether the respondent is familiar with the agency (WILMAPCO)

Performance Area	Measures Used
	▪ Percentage of very satisfied and somewhat satisfied customers (Missouri DOT) ▪ Percentage of customers who trust the agency to keep its commitments (Missouri DOT) ▪ Percentage of customers who feel that the agency provides timely/ accurate/understandable information (Missouri DOT)

Safety and Security

In addition to the federally-required safety measures, many agencies include agency-specific safety measures and targets, as well as measures and targets for security and emergency response.

- The **Grand Forks-East Grand Forks (The Forks) MPO**, in Grand Forks, North Dakota, and East Grand Forks, Minnesota, includes many safety goals, targets, and measures. It has an overarching security goal of "increasing the security of the transportation system for motorized and nonmotorized uses." Underlying objectives include "identify and maintain the security of critical street and highway system assets"; "support State and regional emergency, evacuation, and security plans"; and "ensure that all applicable employees undergo incident response training." Targets include "75 percent of emergency transportation routes remain unblocked" and "clearance time for Federal Aid-eligible route incidents under a 3-year average of 30 minutes."[197] The MPO also sets many injury, fatality, and crash targets, such as 1 transit vehicle-related crash per 100,000 revenue miles.
- The **Rhode Island DOT** includes a range of safety goals and measures in its LRSTP. Its emergency response goals are to "develop transportation and communication systems that serve Rhode Islanders and the region in the event of natural disasters, accidents, and acts of terrorism in a manner that minimizes injury, loss of life, and disruption to the economy; facilitate the evacuation of people; and allow emergency response and recovery activities to occur." The Rhode Island DOT measures progress toward emergency responsiveness through targets such as "improve incident clearance time on Interstate highways from an average time of 40 minutes in 2008 to 38 minutes in 2010, 35 minutes in 2020, and 30 minutes in 2030" and get "primary routes to all hospitals with emergency care facilities [to] function at Level of Service C or better by 2015."

Table 15. Performance measures for safety and security.

Performance Area	Measures Used
Safety	▪ Number of projects intended to reduce crashes at high-collision locations (Casper MPO) ▪ Number of fatalities and serious injuries in work zones (PennDOT) ▪ Number of rail-crossing fatalities, serious injuries, and incidents (PennDOT)

Performance Area	Measures Used
Emergency response	▪ Percentage of emergency transportation routes that are unblocked (The Forks MPO) ▪ Clearance time for Federal Aid-eligible route incidents (The Forks MPO) ▪ Average incident clearance time on Interstate highways (Rhode Island State Planning Council) ▪ Level of service on primary routes to hospitals with emergency care facilities (Rhode Island State Planning Council)

Transit

Some long-range plans include additional performance measures related to different aspects of public transit service and utilization beyond those required in relation to Federal transit asset management and safety measures. Measures range from increased use of the public transit system to more detailed measures for customer service or public transit scheduling performance.

Table 16. Performance measures for transit.

Performance Area	Measures Used
Ridership	▪ Passengers per hour on public transit (Casper MPO) ▪ Increased transit mode share (Portland Metro) ▪ Mode choice percentages for work trips and for all trips (Des Moines MPO) ▪ Transit ridership among the activity centers (ARC) ▪ Mode choice in U.S. Census tracts with high concentrations of environmental justice (EJ) populations (ARC)
Access	▪ Percentage of non-work-related trips accessible within 15 minutes by transit (SANDAG) ▪ Number of jobs reachable within 40 minutes via transit (MORPC) ▪ Percentage of the population living within 0.75 mile of a transit stop (MORPC)
Service	▪ Overall rate of denied transit trips (Casper MPO) ▪ Transit user complaints (Coastal Region MPO) ▪ Bus and other public transit on-time performance (Casper MPO) ▪ Coverage of intelligent transportation systems to share traveler information (Coastal Region MPO)

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Appendix E. Planning Work Program Strategies and Activities by Performance Topic

Active Transportation

Table 17. Active transportation performance strategies and activities.

Collaboration	▪ Work with the other agencies to implement greenways plans, bike share plans (PennDOT and Capital Region COG in Connecticut). ▪ Work with partners to develop a skywalk pedestrian count program and a bike count program (Des Moines Area MPO and Oklahoma DOT).[198,199] ▪ Create a statewide inventory of existing and proposed bicyclist/pedestrian facilities (Oklahoma DOT[200]). ▪ Develop a regional request for proposal (RFP) for dockless bike share services (Capital Region COG).[201] ▪ Identify member jurisdictions' studies where the MPO can "provide support to communities by creating bicycle and pedestrian improvement projects" (Boston Region MPO).[202] ▪ Host quarterly meetings related to greenways (MORPC).[203]
Data Collection	▪ Create inventories of active transportation needs, such as gaps in a bicycle and sidewalk network (Boston Region MPO, Capital District Transportation Committee [CDTC], Oregon DOT, and Washington State DOT).[204] ▪ Obtain counts of bicyclist, pedestrian, and trail users (Des Moines Area MPO,[205] Oklahoma DOT,[206] and Santa Fe MPO[207]). ▪ Survey the public about biking and walking activities (Memphis Urban Area MPO).[208] ▪ Collect and analyze crash report data from local law enforcement departments to determine primary crash factors (Knoxville Transportation Planning Organization).[209]
Plans and Studies	▪ Maintain an app that supports active transportation and wellness activities (Wichita Area MPO).[210] ▪ Complete a pedestrian-bike bridge feasibility study (Metro).[211] ▪ Develop or update plans for active transportation, bicycle, pedestrian, or multi-use paths (Capital Region COG, CDTC,[212] and MORPC[213]). ▪ Research best practices for design, maintenance, and construction of a bicyclist/ pedestrian infrastructure (CDTC). ▪ Study the impacts of intersection treatments and traffic characteristics on bicyclist safety (Oregon DOT).[214] ▪ Study plans for the timing of pedestrian crossings at intersections (CDTC).[215] ▪ Study nonmotorized crashes and deaths and serious injuries of pedestrians (Oregon DOT).
Technical Assistance	▪ Use grant programs to support active transportation planning and implementation in communities (SANDAG and Wichita Area MPO).

	▪ Update the bicyclist/pedestrian prioritization tool and provide technical assistance to communities (CDTC).[216] ▪ Develop guidance on context-sensitive design (Oregon DOT).[217] ▪ Encourage commuters to travel the final part of their commutes via bicycle through the Park-and-Pedal program (MORPC).[218]

Congestion and Reliability

Table 18. Congestion and reliability performance strategies and activity examples.

Collaboration	▪ Partner to purchase the extended dataset and tools from the Regional Integrated Transportation Information System and INRIX for all State highways (Rockingham Planning Commission).[219] ▪ Coordinate to monitor congestion and continue to review the National Performance Management Research Data Set (Capital Region COG). ▪ Develop an advanced congestion analysis tool in partnership with a university (Mid-Hudson Valley TMA[35]).[220]
Data Collection	▪ Create a data-driven congestion management plan (Rhode Island State Planning Council).[221] ▪ Conduct an intelligent transportation system and transportation systems management and operations survey and self-assessment, and an inventory of signalized intersections (CDTC). ▪ Identify data gaps in traffic monitoring and publish data in story maps and dashboards (MAPA).[222] ▪ Evaluate the traffic operations of intersections using travel-time and delay data; recommend operational improvements (Boston Region MPO).[223]
Plans and Studies	▪ Analyze data for the congestion management process (CMP) update (Capital Region COG and DVRPC).
Technical Assistance	▪ Maintain an online rideshare matching system (MORPC).[224] ▪ Collaborate with the city to provide 40,000 free transit passes for downtown workers (MORPC).[225]

[35] The Mid-Hudson Valley Transportation Management Area (TMA) is a collaboration among three New York State metropolitan planning organizations (MPOs): Dutchess County Transportation Council, Orange County Transportation Council, and Ulster County Transportation Council.

Economic Development

Table 19. Economic development performance strategies and activity examples.

Collaboration	▪ Gain support for community revitalization marketing programs through outreach and collaboration (DVRPC).[226] ▪ Contract with advertising and website consultants on community revitalization marketing programs (DVRPC).[227] ▪ Participate in or lead regional coordination meetings (DVRPC and Yuma MPO).[228]
Data Collection	▪ [None found in those reviewed.]
Plans and Studies	▪ Complete an economic impact study for public ports (Missouri DOT).[229]
Technical Assistance	▪ Administer the Transportation and Community Development Initiative program (DVRPC). ▪ Engage with local stakeholders and community leaders, and provide technical assistance to communities on revitalization strategies (DVRPC).[230] ▪ Maintain the database for smart growth and community development grants (DVRPC).[231]

Environmental Sustainability and Resiliency to Natural Hazards

Table 20. Environmental sustainability and resiliency performance strategies and activity examples.

Collaboration	▪ Coordinate on efforts related to resilience, alternative fuel vehicles, and more. (DVRPC and Rhode Island State Planning Council). ▪ Assist in developing quantitative tools to evaluate the links among development patterns, energy use, and emissions (DVRPC). ▪ Administer a public-private coalition of businesses and organizations that promotes air quality through voluntary actions (DVRPC). ▪ Collaborate with other State departments of transportation (DOTs) on implementing recommendations related to post-earthquake response (Missouri DOT). ▪ Assist in implementing the State's adaptation plan (Rhode Island State Planning Council).
Data Collection	▪ Evaluate erosion control practices and products (Nebraska DOT[232] and Oklahoma DOT[233]). ▪ Conduct a vulnerability assessment (CDTC, DVRPC, NYMTC, and Rhode Island State Planning Council). ▪ Monitor coastal landslides and bluff retreats for targeted risk assessment (Oregon DOT).[234] ▪ Conduct an analysis of highway system impacts on total maximum daily load watersheds (Oregon DOT). ▪ Collect and analyze data on energy use and cost (DVRPC).

	▪ Conduct a GHG emissions and energy use inventory (DVRPC).
Plans and Studies	▪ Resilience and adaptation planning (CDTC, DVRPC, NYMTC, and Rhode Island State Planning Council). ▪ Research resiliency practices for incorporation into future studies (Boston Region MPO). ▪ Conduct a State climate variability study (Ohio DOT). ▪ Study options for integrating a systematic ecosystems approach within the State regulatory framework (Wisconsin DOT).
Technical Assistance	▪ Help partners implement energy efficiency practices, plan for resilience, and analyze impacts (DVRPC). ▪ Provide resources and training business and property owners about energy efficiency improvements, and preparing for impacts from natural hazards (DVRPC). ▪ Pool municipal buying power to facilitate the transition to energy-efficient street lighting through the Regional Street Lighting Procurement Program (DVRPC). ▪ Develop a resilience toolkit (BRTB).

Equity and Health

Table 21. Equity and health performance strategies and activity examples.

Collaboration	▪ Form an Americans with Disabilities Act Transition Plan Working Group (CDTC).[235] ▪ Work with the State Coalition for Environmental Justice (EJ) to review whether MPO plans have disproportionate impacts (Capital Region COG).[236] ▪ Work with the Accessible Transportation Advisory Committee or other forums for transit-dependent residents to provide input on transit service issues (Rhode Island State Planning Council).
Data Collection	▪ Conduct equity and EJ analyses (Boston Region MPO and Rhode Island State Planning Council).[237] ▪ Develop a public health/transportation model using 2018 National Household Travel Survey data (Des Moines Area MPO).[238]
Plans and Studies	▪ Study the equity implications of transit fare systems eliminating cash payments (Boston Region MPO).[239] ▪ Develop transit-oriented development plans that include options for equitable development and neighborhood stabilization (Portland Metro).[240] ▪ Identify brownfields that can be used for mixed-use and affordable housing development (Capital Region COG).[241] ▪ Study how State transportation plans interact with Federal, State, and tribal conservation plans, maps, and inventories of natural and historic resources (Wisconsin DOT).
Technical Assistance	▪ [None found in those reviewed.]

Freight

Table 22. Freight performance strategies and activity examples.

Collaboration	▪ Participate in implementing a statewide freight plan (CDTC). ▪ Participate on freight committees (Denver Regional COG[242] and Kansas DOT). ▪ Work with stakeholders to determine the transportation issues that negatively impact freight-focused businesses and cluster industrial uses (Madison Area TPB).[243]
Data Collection	▪ Evaluate weigh-in-motion data for use in performance monitoring, freight models, and analysis (Oregon DOT).[244] ▪ Identify highway geometric issues for oversize/overweight loads (Kansas DOT).[245] ▪ Study how commercial vehicles affect traffic patterns (Denver Regional COG).[246] ▪ Use INRIX traffic speed data to identify freight bottlenecks (Des Moines Area MPO).[247] ▪ Prepare a geographic information system (GIS) database of railroad infrastructure (DVRPC).[248]
Plans and Studies	▪ Study freight access issues (DVRPC).[249] ▪ Study the impacts of new interchanges (DVRPC).[250] ▪ Conduct a feasibility study of new transfer facilities (Des Moines Area MPO).[251] ▪ Engage in the connected automated transportation initiatives and other freight planning activities (Washington State DOT).[252] ▪ Study how new technologies may impact the demand for future transportation facilities (Madison Area TPB).[253]
Technical Assistance	▪ Implement vehicle-to-infrastructure technologies (Madison Area TPB).[254]

Land Use Linkages

Table 23. Land use linkage performance strategies and activity examples.

Collaboration	▪ Participate in land use planning coordination meetings and other activities (Yuma MPO, PennDOT, and Wisconsin DOT). ▪ Assist with managing and monitoring use of the State's Habitat Conservation Fund in the region (SANDAG).[255]
Data Collection	▪ Support the development and analysis of land use data to support land use planning (DVRPC). ▪ Develop new land use data and maps (Rhode Island State Planning Council).
Plans and Studies	▪ Prepare or update the State Conservation and Outdoor Recreation Plan, State Historic Preservation Plan, Economic Development Plan, State Housing Strategies and Plan, and Land Use 2050: Rhode Island's Plan for Land Use and Transportation (Rhode Island State Planning Council).

	▪ Implement an Action Agenda for a Connected, Competitive, Vibrant, and Green Knowledge Corridor (Capital Region COG).
Technical Assistance	▪ Support transit- and pedestrian-oriented development with programs that support appropriate land use or redevelopment planning, zoning, and other regulatory options (NJTPA). ▪ Provide grants that support transit-oriented development and other land use patterns that support walking, bicycling, and transit use (ARC and SANDAG). ▪ Provide training on the analysis of the indirect and cumulative effects of transportation projects (Wisconsin DOT).[256] ▪ Develop incentives for local land use and transportation planners to consider State facilities during planning (Washington State DOT).

Pavement and Bridges

Table 24. Pavement and bridges performance strategies and activity examples.

Collaboration	▪ [None found in those reviewed.]
Data Collection	▪ Conduct an annual pavement condition survey, refine pavement performance curves, and develop a prediction model for pavement temperature (ITD). ▪ Identify data gaps in pavement data collection and publish data in story maps and dashboards (MAPA).[257] ▪ Collect data about pavement conditions on bicycle and pedestrian trails using a device mounted on electric bicycles (Des Moines MPO).[258]
Plans and Studies	▪ Conduct studies related to asset management, such as Resilient and Rapid Repair Measures for Seismically Vulnerable Bridges and Improving the Constructability and Durability of Concrete Pavements (Oregon DOT).
Technical Assistance	▪ Not applicable

Safety and Security

Table 25. Safety and security performance strategies and activity examples.

Collaboration	▪ Facilitate and support the State Highway Safety Improvement Program's (HSIP) local programs (DVRPC). ▪ Collaborate with partners to identify systemic safety projects (DVRPC). ▪ Support partners' research into street typologies, intersection studies, complete street projects, traffic calming, and speed management (DVRPC). ▪ Convene safety committees and meetings (CDTC[259] and Indian Nations COG[260]). ▪ Participate in the development of the New York State DOT Intersection Safety Action Plan (CDTC).[261]

Data Collection	▪ Analyze safety data (Indian Nations COG[262] and Oregon DOT). ▪ Evaluate the safety of intersections using crash data and "equivalent property damage only" crashes to rank clusters and recommend safety improvements (Boston Region MPO). [263] ▪ Use the New York State DOT Crash Location Engineering & Analysis Repository; update TIP safety calculations and the merit score methodology (CDTC).[264] ▪ Develop a crash inventory database, mapping, and data collection (Yuma MPO and Kansas DOT). ▪ Tailor Safety Performance Functions calibration factors for identifying high-priority locations (Mississippi DOT). ▪ Update the map of high-injury corridors overlapping with communities of color, English language learners, and lower income communities (Metro). ▪ Identify roadways with the highest number of serious crashes (Metro).
Plans and Studies	▪ Create a list of roadway risk factors (CDTC).[265] ▪ Study truck driver at-fault crashes, nonmotorized crashes, and deaths and serious injuries of senior drivers (Oregon DOT). ▪ Conduct a study of priority strategies for low-cost safety improvements in the National Cooperative Highway Research Program Report 500 Guides (Wyoming DOT and Missouri DOT).
Technical Assistance	▪ Assist partners in developing and advancing safety projects, and applying them to HSIP for funding (DVRPC).[266] ▪ Support local safety programs and planning (DVRPC and Capital Region COG). ▪ Provide funding through the High-Risk Rural Roads Program and other safety programs (NJTPA).[267] ▪ Conduct a safety social media campaign (CDTC). ▪ Develop a systemic safety toolkit (CDTC).[268] ▪ Manage a motorcycle safety and education program (Oklahoma DOT).[269] ▪ Establish a driver's education course at a local high school (FAST Planning).[270]

Transit

Table 26. Transit performance strategies and activity examples.

Collaboration	▪ Maintain the interagency coordination program, which coordinates with relevant agencies on transit equity and transit-land use connections (Caltrans).[271] ▪ Collaborate with Caltrans, public transit providers, and other local agencies to improve a performance measurement system (used to track freeway volumes and speeds) so that it tracks data for multiple transportation modes, including transit and arterial data (SANDAG). ▪ Coordinate with the State on the study of transit corridors and supportive land use. (BRTB).[272] ▪ Cooperate with State DOT and transit operators to improve transit safety and security, including at bus stops (Capital Region COG).

Data Collection	▪ Develop new data analysis methods that can integrate transit, bicyclists/pedestrians, and land use considerations (DVRPC). ▪ Study transit funding needs and governance structure (BRTB).[273] ▪ Identify transit corridors and corridors for transit signal priority (BRTB).[274]
Plans and Studies	▪ Study first- and last-mile issues, such as ferry terminal parking and transit-oriented development (Washington State DOT and Rhode Island State Planning Council). ▪ Study options for joint operations and intermodal efficiency (Washington State DOT and MORPC). ▪ Studies related to changes in technology, such as mobility on-demand, integrating technology into transit, bus automation, and cashless fare systems (Rhode Island State Planning Council, Washington State DOT, and Boston Region MPO). ▪ Public transit master plans and strategic business planning, including studying potential funding sources (Rhode Island State Planning Council and Capital Region COG). ▪ Develop transit sustainability plans (Rhode Island State Planning Council).
Technical Assistance	▪ Provide trip planning resources (Rhode Island State Planning Council). ▪ Support local operators' data and analysis needs (BRTB).[275] ▪ Administer programs for sales tax-funded transportation improvements, including the New Major Corridor Transit Operations Program (SANDAG). ▪ Administer Federal Transit Administration (FTA) funding programs, including issuing calls for projects and selecting projects (Wichita Area MPO).[276] ▪ Market regional transportation demand management (TDM) programs (MORPC). ▪ Encourage employers to locate near existing transit (MORPC).

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