



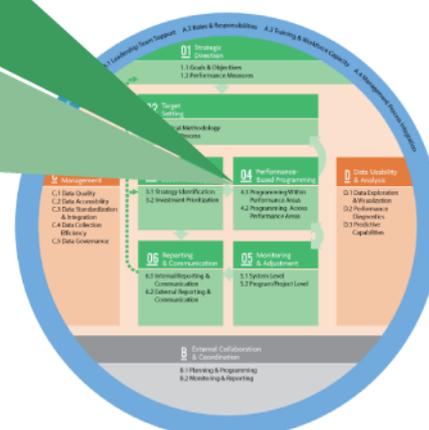
COMPONENT 4

PERFORMANCE- BASED PROGRAMMING

This chapter provides assistance to transportation agencies with the “Performance-Based Programming” component of Transportation Performance Management (TPM). It discusses where performance-based programming occurs within the TPM Framework, describes how it interrelates with the other nine components, presents definitions for associated terminology, provides links to regulatory resources, and includes an action plan exercise. Key implementation steps are the focus of the chapter. Guidebook users should take the TPM Capability Maturity Self-Assessment (located in the TPM Toolbox at www.tpmtools.org) as a starting point for enhancing TPM activities. It is important to note that federal regulations for performance-based programming may differ from what is included in this chapter.

04 Performance-Based Programming

- 4.1 Programming Within Performance Areas
- 4.2 Programming Across Performance Areas



INTRODUCTION

Performance-based programming uses the strategies and priorities established under performance-based planning to guide the allocation of resources to projects in order to achieve strategic goals, objectives, and performance targets. Performance-based programming establishes clear linkages between investments made and their expected outputs and outcomes.

In performance-based programming, the planning strategies included in long-range transportation plans (LRTP) and other performance-based plans translate into project selection criteria. Agencies use the project selection criteria to allocate resources to specific projects and programs with the aim of achieving strategic goals, objectives, and performance targets established in the Strategic Direction (Component 01) and documented in the LRTP and other plans created during the Performance-Based Planning process (Component 03).

Completing a round of performance-based programming will result in two key products: a number of metropolitan planning organization (MPO) Transportation Improvement Program (TIP) documents and a State Transportation Improvement Program (STIP). These documents identify projects that will be funded, the timeframe for implementation, and the sources of funding that are being committed. Projects included in the STIP and TIP, when completed, should move the agency toward attainment of goals, objectives, and performance targets; these documents continue the linkage between the Strategic Direction, Target Setting, and Performance-Based Planning. To support development of the STIP and TIP, agencies can engage in scenario planning,¹ or take an analytical approach to evaluating how various combinations of strategies (scenarios) may impact system performance.² The STIP must incorporate projects shown in all MPO TIPs in the state, as well as transit projects. Inclusion in the STIP makes the project eligible for federal funding.³

A performance-based approach to programming is focused on project outcomes and how projects can push progress toward goals, objectives, and performance targets.

In this data-driven decision structure, a number of key factors should be incorporated:

- **Influencing factors** such as how the political context will affect what projects are programmed.
- **Internal collaboration** across performance areas within an agency must be evaluated. It is critical to challenge silo-based programming and budgeting and weigh and document tradeoffs between performance areas. Funding will be divided amongst preservation, expansion, and other areas; the tradeoffs should be understood, agreed upon, communicated, and documented to build and maintain support for performance-based programming.
- **External stakeholder involvement** from partner agencies, the public, and policymakers is needed to reaffirm the commitment to agency goals, objectives and performance targets.
- **Funding and resource constraints** should be considered from the outset. Since different projects qualify for different types of funding, a full menu of how monies and resources could be applied is vital to understanding the possibilities for programming considering varying constraints associated with federal and other funding programs.⁴

While performance-based planning and performance-based programming (PBPP) are often discussed as one process, there are important differences between them. This guidebook heavily references FHWA's "*Performance Based Planning and Programming Guidebook*"⁵ while separating the planning and programming processes to highlight:

¹ FHWA. (2011). Scenario Planning Guidebook. Washington, DC.

https://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/scenario_planning_guidebook/

² FHWA. (2013). *Performance-Based Planning and Programming Guidebook* (FHWA Publication FHWA-HEP-13-041). Washington, DC.

³ FHWA. (2013). *Performance-Based Planning and Programming Guidebook* (FHWA Publication FHWA-HEP-13-041). Washington, DC.

⁴ For example, see the FTA's funding support page at <http://www.fta.dot.gov/grants/12867.html>

⁵ FHWA. (2013). *Performance-Based Planning and Programming Guidebook* (FHWA Publication FHWA-HEP-13-041).

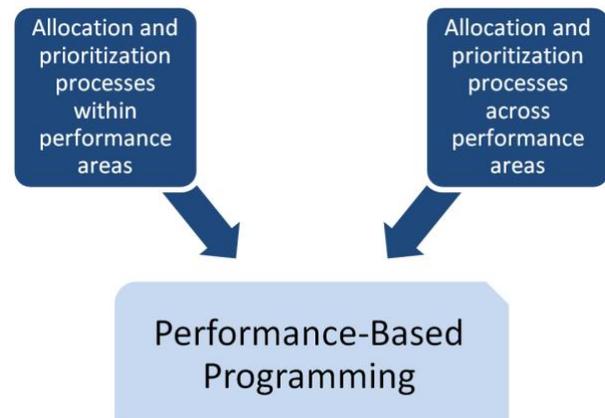
1. Differences and interconnections between planning and programming processes by demonstrating the role they play in implementing TPM, and
2. How to implement a PBPP process as part of TPM.

SUBCOMPONENTS AND IMPLEMENTATION STEPS

Figure 4-1: Subcomponents for Performance-Based Programming

Source: Federal Highway Administration

The definition for performance-based programming is: the use of strategies and priorities to guide the allocation of resources to projects that are selected to achieve goals, objectives, and targets. Performance-based programming establishes clear linkages between investments made and expected performance outputs and outcomes. The performance-based programming component is comprised of two subcomponents (Figure 4-1): Programming Within Performance Areas and Programming Across Performance Areas.



- **Programming Within Performance Areas:** The allocation and prioritization processes within a performance area, such as safety, infrastructure, mobility, etc.
- **Programming Across Performance Areas:** The allocation and prioritization processes across performance areas, such as safety, infrastructure, mobility, etc.

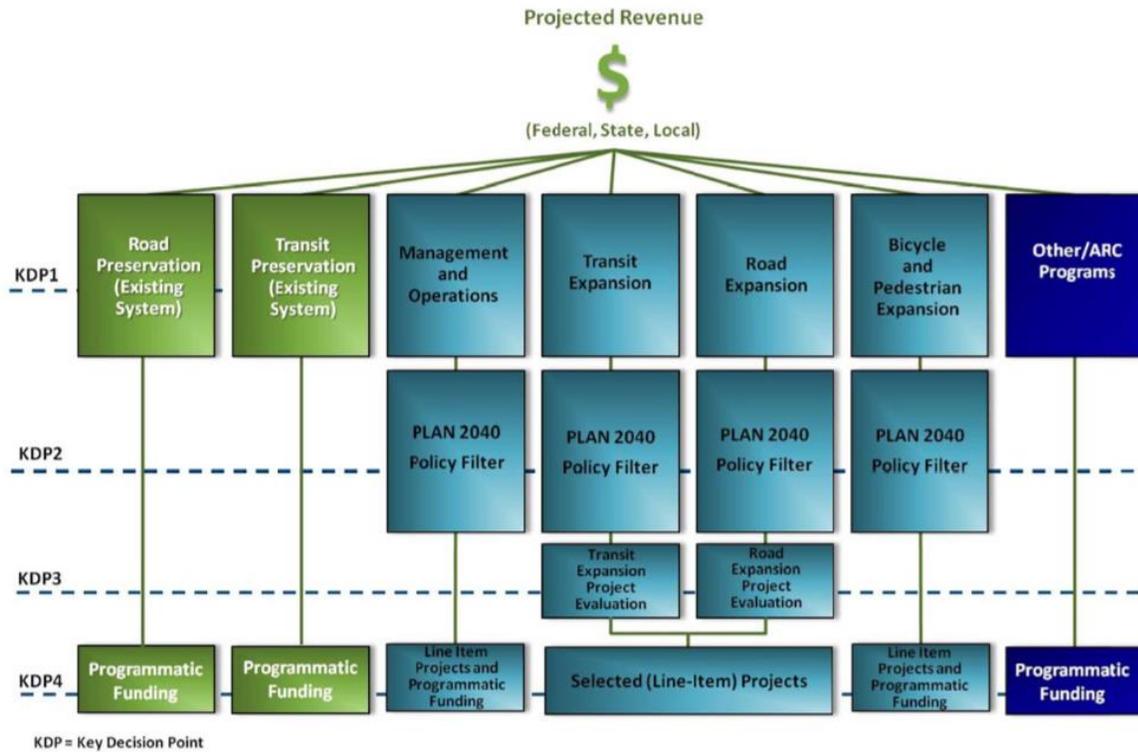
Programming Within Performance Areas

In transportation agencies, programming within performance areas is generally a more mature practice than programming across performance areas because of historical approaches to resource allocation based on legacy or a fix-it-first mentality, among others.⁶ As a result, many agencies still struggle to link allocation decisions to strategic goals. Because performance measures are tied to strategic goals, agencies should develop project selection criteria based on performance measures; using these criteria (Figure 4-2) to select projects for funding will move the overall program toward supporting stated strategic goals. By screening projects using criteria that require linkage to goals, the agency has a better chance of meeting stated goals. Figure 4-2 illustrates how the Atlanta Regional Council allocates funding to various project types using criteria in performance-based plans to evaluate projects for funding (policy filters).

⁶ Maggiore, M., Ford, K.M., High Street Consulting Group, & Burns & McDonnell. Transportation Research Board. (2015). *Guide To Cross-Asset Resource Allocation and the Impact on Transportation System Performance*: NCHRP Report 806. Washington, DC. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf

Figure 4-2: Atlanta Regional Commission Programming Process

Source: Atlanta Regional Commission PLAN 2040⁷



Therefore, project selection criteria become a critical piece of the programming process. Some agencies use a quantitative scoring approach while others use this only as a first step, adding an additional screening for project feasibility, funding availability, and project timing. Other agencies may rely heavily on economic analyses within program areas such as bridge or pavement to prioritize projects to minimize lifecycle costs.

Once projects are selected and programmed, the agency then monitors projects to determine how well projects contributed to attaining targets and meeting goals. That information is then used to adjust future planning and programming cycles to continually improve performance (see Monitoring and Adjustment, Component 05).

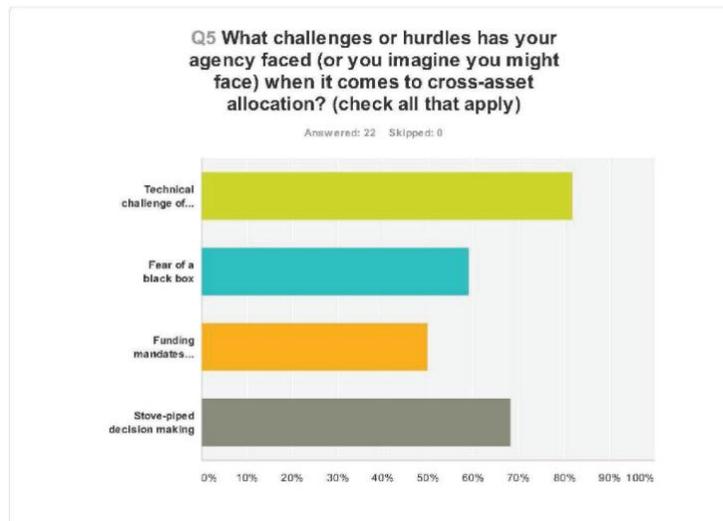
Programming Across Performance Areas

Cross-performance area programming is still an emerging process as illustrated by research and the state of the practice review conducted under NCHRP 806 Report, *“Guide to Cross-Asset Resource Allocation and the Impact on Transportation System Performance.”*⁸ Figure 4-3 makes clear how challenging agencies perceive cross-asset allocation to be.

⁷ Atlanta Regional Council. (2014). Atlanta Regional Transportation Plan. Atlanta, GA.

⁸ Maggiore, M., Ford, K.M., High Street Consulting Group, & Burns & McDonnell. Transportation Research Board. (2015). *Guide To Cross-Asset Resource Allocation and the Impact on Transportation System Performance*: NCHRP Report 806. Washington, DC. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf

Figure 4-3: Workshop Survey Response, Question 5

Source: Guide to Cross-Asset Resource Allocation⁹

A number of agencies are developing cross-performance area approaches to prioritization, or are already prioritizing, across performance areas. These agencies are highlighted throughout illustrative examples for each implementation step later in the chapter.

While cross performance area programming approaches vary, it generally includes the following pieces:¹⁰

- **Project scoring** using project selection criteria that link projects to goals
- **Prioritizing based on value** of project per dollar spent
- **Optimizing** to select projects based on budget constraints
- **Trade-off analysis** to determine the impacts on all performance areas of a particular allocation scenario

Agencies have determined varying ways to score projects, but often projects are categorized into a relatively few number of categories so that projects can be appropriately compared. Each category can weigh goal areas differently, to ensure projects of a particular type are not penalized for weak linkage to a goal that is not relevant. For example, a project category devoted to capacity expansion projects would be expected to have no linkage to system preservation; in this case, the weight for the system preservation goal area would be low relative to other goals. Project selection criteria are then developed to evaluate projects' value and contribution toward strategic goals. The output of this process is a prioritized list of projects based on goal linkage.

Further prioritization steps are then taken including those based on benefit/cost and budget constraints. With an unlimited budget, performance would theoretically be very high in all performance areas; however, budgets are indeed constrained and this requires an analysis of trade-offs.

“It should be noted that that ability of transportation agencies to implement a fully flexible, discretionary approach to resource allocation varies across the country due to unique institutional, organization, and political situations.”

Source: NCHRP Report 806, Cross-Asset Resource Allocation

⁹ Maggiore, M., Ford, K.M., High Street Consulting Group, & Burns & McDonnell. Transportation Research Board. (2015). *Guide To Cross-Asset Resource Allocation and the Impact on Transportation System Performance*: NCHRP Report 806. Washington, DC. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf

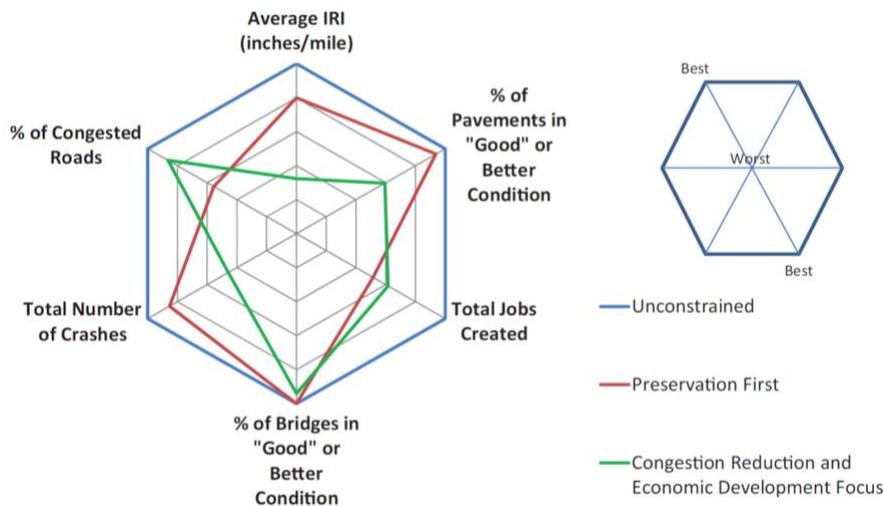
¹⁰ Maggiore, M., Ford, K.M., High Street Consulting Group, & Burns & McDonnell. Transportation Research Board. (2015). *Guide To Cross-Asset Resource Allocation and the Impact on Transportation System Performance*: NCHRP Report 806. Washington, DC. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf

Assessing trade-offs between investment scenarios (i.e., scenario planning¹¹) is a key element of cross performance area prioritization. The agency must choose which goal areas are most significant and allocate resources to those areas to achieve desired performance levels, while remaining funding is allocated elsewhere. However, performance cannot fall too low in the less critical goal areas, so trade-off analysis is essential to preventing this situation. Because overall resources are limited, focusing resources in particular areas (such as pavement condition, or congestion reduction) drives greater benefits in focused areas compared to other areas.

Figure 4-4 the effect of goal area prioritization and budget constraints. The blue line represents an unconstrained scenario where all needs are fully funded, and desired performance can be maintained in all goal areas. The red and green lines represent two constrained scenarios. If an agency focuses on preservation first (red line), the diagram demonstrates how pavement and bridge condition improve (red line extends out to these goal areas), while the percentage of congested roads may increase. In the congestion reduction and economic development scenario (green line), congestion decreases but pavement condition and International Roughness Index (IRI) decreases.¹² Trade-off analysis provides an opportunity for executives, staff, stakeholders, and users to discuss what truly matters.¹³ Using visual aids like the one below can assist such a discussion.

Figure 4-4: Impact on Performance Outcomes by Goal Area Prioritization

Source: Guide to Cross-Asset Resource Allocation and the Impact on Transportation System Performance ¹⁴



Challenges to this process abound. Many transportation agencies allocate resources based on legacy, with previous funding allocation determining future allocation. Other transportation agencies operate with a fix-it first mentality, leaving only limited funding to be prioritized. Major barriers to implementing improved approaches include a weak strategic direction; agencies do not prioritize goal areas. As discussed above, this is critical. Other barriers include

¹¹ Federal Highway Administration. (2011). Scenario Planning Guidebook.

http://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/scenario_planning_guidebook/guidebook.pdf

¹² Maggiore, M., Ford, K.M., High Street Consulting Group, & Burns & McDonnell. Transportation Research Board. (2015). *Guide To Cross-Asset Resource Allocation and the Impact on Transportation System Performance*: NCHRP Report 806. Washington, DC. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf

¹³ Maggiore, M., Ford, K.M., High Street Consulting Group, & Burns & McDonnell. Transportation Research Board. (2015). *Guide To Cross-Asset Resource Allocation and the Impact on Transportation System Performance*: NCHRP Report 806. Washington, DC. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf

¹⁴ Maggiore, M., Ford, K.M., High Street Consulting Group, & Burns & McDonnell. Transportation Research Board. (2015). *Guide To Cross-Asset Resource Allocation and the Impact on Transportation System Performance*: NCHRP Report 806. Washington, DC. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf

lack of data and forecasting tools, institutional resistance to changing allocation processes, as well as resistance by partners, and political resistance from decision makers who feel their authority threatened.¹⁵

Despite these challenges, agencies have begun to program across performance areas and are highlighted in the implementation steps for subcomponent 4.1. While both sets of implementation steps will assist an agency in performance-based programming, the steps differ because of the important differences between programming within and across performance areas. However, it is important to note that both within and across performance area, programming efforts rely on project selection criteria and the purpose of both efforts is STIP and TIP development.

Table 4-1: Performance-Based Programming Implementation Steps

Source: Federal Highway Administration

Programming Within Performance Areas	Programming Across Performance Areas
1. Clarify roles of internal staff and external stakeholders	1. Identify and assign internal roles and responsibilities
2. Develop project selection criteria	2. Clarify purpose of cross performance area prioritization
3. Establish a formal input process to gather performance-based project information	3. Develop a methodology that reflects agency priorities and external stakeholder interests
4. Document the process	4. Document the process

As illustrated in Table 4-1, programming takes the prioritized projects developed in the planning stage and links them to funding. Most importantly, programming demonstrates how funding can be most effectively utilized to improve performance or achieve targets. Using these steps allows an agency to implement the process based on performance goals, first within performance areas and building builds additional understanding of tradeoffs across performance areas.

CLARIFYING TERMINOLOGY

Table 4-2 presents the definitions for the performance-based programming terms used in this Guidebook. A full list of common TPM terminology and definitions is included in Appendix C: Glossary.

Table 4-2: Performance-Based Programming: Defining Common TPM Terminology

Source: Federal Highway Administration

Common Terms	Definition	Example
Goal	A broad statement of a desired end condition or outcome; a unique piece of the agency’s vision.	A safe transportation system.
Objective	A specific, measurable statement that supports achievement of a goal.	Reduce the number of motor vehicle fatalities.
Performance Measure	Performances measures are based on a metric that is used to track progress toward goals, objectives, and achievement of established targets. They should be manageable, sustainable, and based on	Transit passenger trips per revenue hour.

¹⁵ Maggiore, M., Ford, K.M., High Street Consulting Group, & Burns & McDonnell. Transportation Research Board. (2015). *Guide To Cross-Asset Resource Allocation and the Impact on Transportation System Performance*: NCHRP Report 806. Washington, DC. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf

Common Terms	Definition	Example
	collaboration with partners. Measures provide an effective basis for evaluating strategies for performance improvement.	
Program	A program is a document which matches funding to projects.	A State Transportation Improvement Program (STIP).
Project Selection Criteria	Evaluation metrics used to rank projects.	Numerical weights assigned to goals such as economic impact or environmental effects.
Scenario	Scenarios use funding and performance data to determine likely future outcomes.	An investment of five % more revenue may reduce SD bridges by 10%.
Scenario Planning	A technique designed to help citizens and stakeholders understand how changes in various forces potentially impact transportation networks in an area. ¹⁶	Engaging the public in a workshop to compare and contrast the impact of land use scenarios on traffic volumes and distribution.
Transportation Performance Management	A strategic approach that uses system information to make investment and policy decisions to achieve performance goals.	Determining what results are to be pursued and using information from past performance levels and forecasted conditions to guide investments.

RELATIONSHIP TO TPM COMPONENTS

The ten TPM components are interconnected and often interdependent. Table 4-3 summarizes how each of the nine other components relate to the performance-based programming component

Table 4-3: Performance-Based Programming Relationship to TPM Components

Source: Federal Highway Administration

Component	Summary Definition	Relationship to Performance-Based Programming
01. Strategic Direction	The establishment of an agency’s focus through well-defined goals/objectives and a set of aligned performance measures.	Programmed projects are linked directly to the strategic direction since they are prioritized by their potential ability to address goals and objectives.
02. Target Setting	The use of baseline data, information on possible strategies, resource constraints and forecasting tools to collaboratively establish targets.	Programmed projects are selected and funded based on how they help achieve performance targets.
03. Performance-Based Planning	Use of a strategic direction to drive development and documentation of agency strategies and priorities in the long-range transportation plan and other plans.	Performance-based programming allocates funding to projects identified as part of the strategies developed and documented in performance-based plans.

¹⁶ FHWA. (2011). Scenario Planning Guidebook. http://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/scenario_planning_guidebook/

Component	Summary Definition	Relationship to Performance-Based Programming
05. Monitoring and Adjustment	Processes to track and evaluate actions taken and outcomes achieved that establish a feedback loop to adjust planning, programming, and target setting decisions. Provides key insight into the efficacy of investments.	Completed projects from the STIP and TIP should be assessed to determine whether they provided the expected progress toward performance targets.
06. Reporting and Communication	Products, techniques and processes to communicate performance information to different audiences for maximum impact.	The programming process must be transparent and well communicated to ensure support and understanding of prioritization framework by stakeholders.
A. TPM Organization and Culture	Institutionalization of a TPM culture within the organization, as evidenced by leadership support, employee buy-in, and embedded organizational structures and processes that support TPM.	The link between programming and performance must be supported by and understood by leadership and agency-wide to comprehensively implement the process.
B. External Collaboration and Coordination	Established processes to collaborate and coordinate with agency partners and stakeholders on planning/ visioning, target setting, programming, data sharing, and reporting.	The programming process must be clearly communicated to external stakeholders and coordinated with partner agencies. For example, a State DOT's STIP and an MPO's TIP must align.
C. Data Management	Established processes to ensure data quality and accessibility, and to maximize efficiency of data acquisition and integration for TPM.	Programming relies on data managed from various sources, including those from partner agencies.
D. Data Usability and Analysis	Existence of useful and valuable data sets and analysis capabilities, provided in usable, convenient forms to support TPM.	The programming process is based on good analysis of scenarios derived from an understanding of funding and baseline data projected forward into the future.

REGULATORY RESOURCES

This Guidebook is intended to assist agencies with implementing transportation performance management in a general sense and not to provide guidance on compliance and fulfillment of Federal regulations. However, it is important to consider legislative requirements and regulations when using the Guidebook. In many cases, use of this Guidebook will bring an agency in alignment with Federal requirements; however, the following sources should be considered the authority on such requirements:

Federal Highway Administration

- Transportation Performance Management: http://www.fhwa.dot.gov/tpm/links_fhwa.cfm
- Fact Sheets on Fixing America's Surface Transportation (FAST) Act: <https://www.fhwa.dot.gov/fastact/factsheets/>
- Fact Sheets on Moving Ahead for Progress in the 21st Century (MAP-21): <https://www.fhwa.dot.gov/map21/factsheets/>
- Resources on MAP-21 Rulemaking: <https://www.fhwa.dot.gov/tpm/rule.cfm>

Federal Transit Administration

- Fact Sheets on FAST Act: <https://www.transit.dot.gov/funding/grants/fta-program-fact-sheets-under-fast-act>

- Resources on MAP-21: <https://www.transit.dot.gov/regulations-and-guidance/legislation/map-21/map-21-program-fact-sheets>

IMPLEMENTATION STEPS

4.1 PROGRAMMING WITHIN PERFORMANCE AREAS

One facet of Performance-Based Programming is the resource allocation and prioritization processes *within* a performance area, such as safety, infrastructure, or mobility. The following section outlines steps agencies can follow in order to develop a program that is based on performance targets and which supports organizational goals and objectives.

1. Clarify roles of internal staff and external stakeholders
2. Develop project selection criteria
3. Establish a formal input process to gather performance-based project information
4. Document the process

“Performance information is never intended to make the decisions; rather this information is intended to inform the decision makers so the process is more focused on performance outcomes.”

- David Lee, Florida DOT

STEP 4.1.1	Clarify roles of internal staff and external stakeholders
<p>Description</p>	<p>This step defines who is involved in the process, and when and how it will happen. A timeline for the programming process should be outlined, including when input is needed from partner agencies and other stakeholders. Goals, objectives, targets, and performance measures should be reviewed with stakeholders and strongly leveraged by senior management to ensure all involved have an understanding of these guiding elements that shape the program. Individuals should also be very familiar with the performance-based plans developed in the Performance-Based Planning process (Component 03), which build from goals, objectives, and targets to shape the programming of projects. Discussion with partner agencies should also confirm regional priorities.</p>
<p>Examples</p>	<p>Arizona Department of Transportation (ADOT) has established their P2P initiative to link planning to programming within the agency.</p> <p>This program is aimed to:¹⁷</p> <ul style="list-style-type: none"> • Develop a transparent, defensible, logical, reproducible process for programming improvements • Link planning to programming to use funds more effectively • Drive investment decision-making with system performance • Simplify program structure • Implement a risk-based approach • Assist with MAP-21 implementation <p>This approach is reflected in ADOT’s organization of the process in its timeline and staff and stakeholder role outline. The agency demonstrates the alignment of who, what, and when in the agency’s annual program update, as seen below. The spiral schedule gives a month-by-month representation of what group is working on which piece of the process. For example,</p>

¹⁷ Arizona DOT. *Linking Planning and Programming: New Direction for Investment Decisions*. Presentation April 17, 2014. [http://azdot.gov/docs/default-source/planning/p2p-r-s-\(04-17-14\).pdf?sfvrsn=2](http://azdot.gov/docs/default-source/planning/p2p-r-s-(04-17-14).pdf?sfvrsn=2)

STEP 4.1.1	Clarify roles of internal staff and external stakeholders
<p>Linkages to Other TPM Components</p>	<p>Component A: Organization and Culture (See TPM Framework)</p> <p>Component 01: Strategic Direction</p> <p>Component 06: Reporting and Communication</p>
STEP 4.1.2	Develop project selection criteria
<p>Description</p>	<p>Criteria based on agency goals and objectives must be established to guide project selection. This must be understood and supported broadly by stakeholders and be reflective of regional priorities. In addition, the specific sources for the criteria must be reviewed and discussed together, so that criteria reflect priorities in all planning documents. These source documents include the MPO LRTP, state LRTP, asset management plans, transit development plans, local government plans, freight plans, and others.</p> <p>Within these documents there may also be a discussion of risks that should be extrapolated from the priority level within the plans to the project-specific level for the program. As discussed in Performance-Based Planning (Component 03), risk is the positive or negative impact of uncertainty on a process or project. Risks may be positive or negative and generally can be defined as hazard, financial, operational, or strategic risks.¹⁹ Since all risks have financial implications, these must be understood as a variable when considering outcomes based on funding scenarios. As an example, Washington State provides a series of guidelines as to how to incorporate risk into project planning and programming with its Project Risk Management Guide: http://www.wsdot.wa.gov/publications/fulltext/cevp/ProjectRiskManagement.pdf.</p> <p>This guide established a comprehensive process for incorporating risk management into agency processes, including certain requirements to be met depending on project size. A Risk Management program helps agencies expect the unexpected and anticipate additional costs or shifting project budgets as accurately as possible.</p>
<p>Examples</p>	<p>The Pikes Peak Area Council of Governments (PPACG), the MPO for the Colorado Springs, Colorado region, developed a clear set of criteria in its <i>Moving Forward Update 2035</i>, featured as one of FHWA’s case studies in its <i>A Guide for Incorporating Performance-Based Planning</i> (2014).</p> <p>PPACG established a set of evaluation criteria based on its goals and objectives to assess all projects under consideration. The agency assigned one evaluation criterion for each goal, which resulted in a large number of criteria. This is a common situation in any process seeking to gather criteria from a large array of sources and stakeholders. In order to properly align the criteria, PPACG created a weighting system to reflect and credit the relative importance of each criterion for the transportation system. A ranking exercise with the Transportation and the Community Advisory Committees and a phone survey from the public resulted in an</p>

¹⁹ Definitions summarized from NCHRP 806: *Guide to Cross-Asset Resource Allocation and the Impact on Transportation System Performance*, page 20.

STEP 4.1.2	Develop project selection criteria						
	<p>average ranking for each criterion that was adopted by the MPO Board. The result was that PPACG was able to maintain all 17 of the criteria matched to 17 goals, while also very clearly ranking those goals, making the tradeoff process much more straightforward.</p> <p>Table 4-4: PPACG Example of Evaluation Criteria Source: Model Long-Range Transportation Plans: A Guide for Incorporating Performance-Based Planning (2014)²⁰</p> <table border="1"> <thead> <tr> <th>Goal</th> <th>Evaluation Criteria</th> <th>E.C. Weight Value (Rank)</th> </tr> </thead> <tbody> <tr> <td>1. Maintain or improve current transportation system infrastructure</td> <td>Transportation System Condition Preservation and Rehabilitation</td> <td>9.5 (1)</td> </tr> </tbody> </table>	Goal	Evaluation Criteria	E.C. Weight Value (Rank)	1. Maintain or improve current transportation system infrastructure	Transportation System Condition Preservation and Rehabilitation	9.5 (1)
Goal	Evaluation Criteria	E.C. Weight Value (Rank)					
1. Maintain or improve current transportation system infrastructure	Transportation System Condition Preservation and Rehabilitation	9.5 (1)					

Linkages to Other TPM Components	Component A: Organization and Culture (See TPM Framework) Component 03: Performance-Based Planning
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STEP 4.1.3	Establish a formal input process to gather performance-based project information
Description	<p>This step allows specific projects to be assessed relative to the criteria developed in the previous step. Gathering this information enables the agency to track the anticipated effects of projects after their completion, and thus evaluate their impact on the attainment of performance targets and goals. This will provide an answer as to how investments in specific projects also lead toward those targets and goals, enabling an agency to track the flow of money and the efficacy of its impacts. This means that after project completion, the agency will be able to further justify or reexamine the allocation of monies and how programming decisions were made. The input process will build a simple database of project characteristics such as location, start/stop dates, owner, justification, and project description and outcome.</p>
Examples	<p>At the Mid-America Regional Council (MARC), the metropolitan planning organization (MPO) for the greater Kansas City area, an online template library was developed to gather calls for projects for programming efforts.</p>

²⁰ Federal Highway Administration. (2014). Model Long-Range Transportation Plans: A Guide for Incorporating Performance-Based Planning. Washington, DC. http://www.fhwa.dot.gov/planning/performance_based_planning/mlrtp_guidebook/fhwahep14046.pdf

STEP 4.1.3

Establish a formal input process to gather performance-based project information

Figure 4-6: MARC Project Templates

Source: MARC Transportation Department²¹

Project Type	Template
Road & Bridge	
Roadway Capacity	STP_Road_Bridge.pdf
Roadway Operations	STP_Road_Bridge.pdf
Traffic Flow	STP_Road_Bridge.pdf
Bridge Replacement/Rehabilitation	STP_Road_Bridge.pdf
ITS Capital Improvements	STP_Road_Bridge.pdf
Non-Motorized Transportation	
Facilities for Nonmotorized Transportation	CMAQ_STP_TAP_BP.pdf
Recreation Trails	STP_TAP_RT.pdf
Safe Routes to School	STP_TAP_SRTS.pdf
Public Transportation	
Transit Capital	CMAQ_STP_PT_Cap.pdf
Transit Operations	CMAQ_PT_Ops.pdf
Alternative Fuel Vehicles & Infrastructure	CMAQ_Alt_Fuel.pdf
Diesel Retrofit	CMAQ_Diesel_Retrofit.pdf
Electric/Natural Gas Charging	STP_EG_Charge.pdf
Environmental Mitigation	STP_TAP_Mitigation.pdf
Intermodal Interchange within a Port	STP_Intermodal.pdf
Livable Communities	STP_Livable_Comm.pdf
Public Education/Outreach	CMAQ_Outreach.pdf
Transportation Safety	STP_Tran_Safety.pdf

The *Transportation Outlook 2040* LRTP and accompanying TIP included both fiscally constrained and unconstrained project lists, demonstrating how a large number of projects can be narrowed down using a strong set of criteria to match projects with prioritized goal areas, and then constrain them within the range of available funding. The online call for projects page is currently in use for multiple plans, including MARC’s Surface Transportation Program, 2017-2018, Transportation Alternatives (TAP), 2014-2018, and Congestion Mitigation and Air Quality Improvement Program 2015-2018.

The input uses a menu to gather basic information on the project such as program, location, need, modes, description, usage, and relationship to or inclusion in a number of other plans. This allows MARC to receive a large amount of information from a large number of users while simultaneously organizing it into a database-friendly format that will assist in building a prioritized project list. For more, see <http://www.marc2.org/tr-call/index.aspx> and <http://www.marc2.org/tr-call/templates.aspx>.

²¹ Mid-American Regional Council Transportation Department. (2014). Kansas City, MO.

STEP 4.1.3

Establish a formal input process to gather performance-based project information

The **National Capital Region Transportation Planning Board** has a similar online interface that allows project input. In this example, the Maryland Transit Administration (within the Maryland Department of Transportation (MDOT)) has submitted a project report for Rural Transit Operating Assistance.

Figure 4-7: CLRP Online Interface

Source: CLRP: Long Range Transportation Plan²²

The screenshot displays the CLRP (Long-Range Transportation Plan) online interface. The header includes the CLRP logo and navigation tabs: PROJECTS, ELEMENTS, PROCESS, PERFORMANCE, PARTICIPATION, FEDERAL REGULATIONS, and DOCUMENTS. The current page is 'CLRP Project Report'.

Navigation Menu:

- Proposed Changes in 2015
- Highways
- Transit & HDV
- Bicycle & Pedestrian
- Selected Highlights
- Six-Year TIP
- Search the CLRP & TIP
- CLRP Project Listing

Form Fields:

- Submitting Agency: MDOT/Maryland Transit Administration
- Secondary Agency: [Empty]
- Agency Project ID: [Empty]
- CLRP ID: 867
- Project Name: Rural Transit - Operating Assistance
- Project Type: Transit Operational Program
- Facility: [Empty]
- From: [Empty]
- To: [Empty]
- Jurisdiction: Frederick County, Charles County
- Description: Operating assistance for rural service.
- Project Length: [Empty]
- Project expected to be complete in: [Empty]
- Bicycle/Pedestrian Accommodations: No bicycle/pedestrian accommodations included
- This project was completed in: [Empty]
- Cost: (in \$1,000s) [Empty]
- This is an ongoing project and has no completion date:

Congestion Management Information

- Do traffic congestion conditions necessitate the proposed project?
- If so, is the congestion recurring or non-recurring? Non-Recurring
- If the congestion is on another facility, please identify it: [Empty]
- Is this a capacity-increasing project on a limited access highway or other principal arterial?
- Project is exempt from the Congestion Management Process because: [Empty]

SAFETEA-LU Planning Factors

planning factors that are addressed by this project:

- Support the **economic vitality** of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
- Increase the **safety** of the transportation system for all motorized and non-motorized users.
- Is this project being proposed specifically to address a safety issue?
If yes, briefly describe (in quantifiable terms, where possible) the nature of the safety problem: [Empty]
- Increase the ability of the transportation system to support **homeland security** and to safeguard the personal security of all motorized and non-motorized users.
- Increase **accessibility and mobility** of people and freight.
- Protect and enhance the **environment**, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.
- Enhance the **Integration and connectivity** of the transportation system, across and between modes, for people and freight.
- Promote efficient system **management and operation**.
- Emphasize the **preservation** of the existing transportation system.

Environmental Mitigation

- Have any potential mitigation activities been identified for this project?

Linkages to Other TPM Components

Component A: Organization and Culture (See TPM Framework)

Component 01: Strategic Direction

Component 06: Reporting and Communication

Component B: External Collaboration and Coordination

²² CLRP: Long Range Transportation Plan. June 9, 2016. <http://www.mwco.org/clrp/>

STEP 4.1.4 Document the process

Description

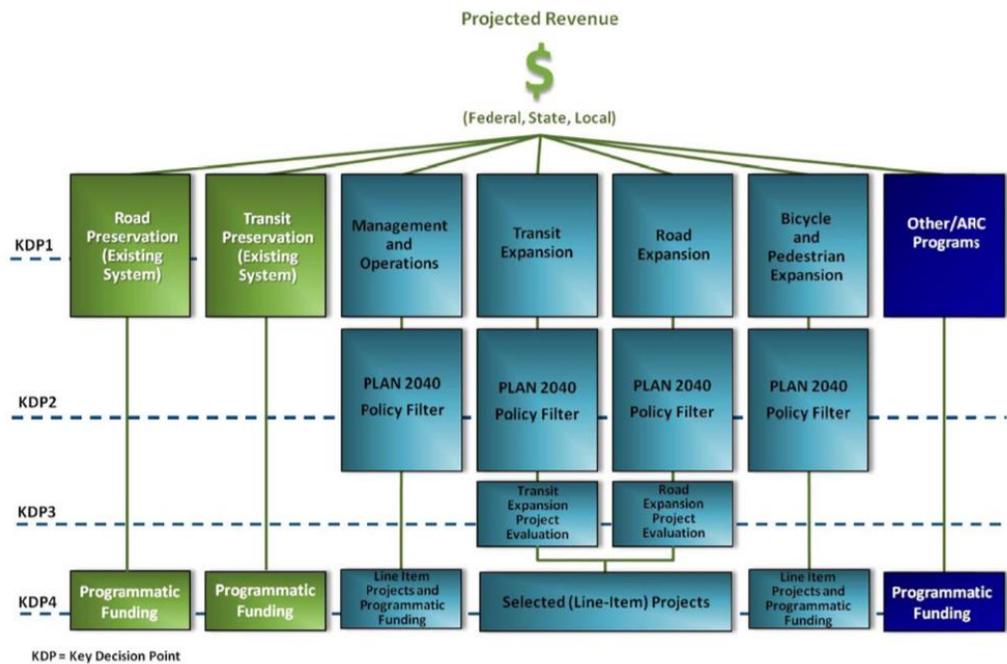
The performance-based programming process must be documented in a manner that ensures transparency and accountability and makes clear how and why projects were chosen for the program. This is one of the major tenets of TPM: ensuring that decisions are based on performance outcomes and making this clear throughout the process. This strengthens the key link back to goals, objectives, and targets. This documentation becomes a vital part of the STIP or TIP. In addition to documenting the process for arriving at that document, further narrative should be included about how the agency will continue to refine the methodology for programming moving forward and how the efficacy of investments will be evaluated.

This documentation is vital not only for inclusion in the final programming document, but also for use in Monitoring and Adjustment (Component 05), which evaluates the efficacy of the overall process of allocating resources toward achieving strategic goals; and Reporting and Communication (Component 06), which enhances internal external understanding of performance results.

Examples

Figure 4-8: Atlanta Regional Commission Plan 2040 Funding Allocation

Source: Atlanta Regional Commission PLAN 2040²³



The Atlanta Regional Commission (ARC) provides an illustration of documenting the programming process in this figure on project selection from its PLAN 2040 Regional Transportation Plan.

This figure illustrates where and how funding is allocated. It provides a quick reference to key decision points (KDP) where input is needed to shape project selection.

²³ Atlanta Regional Council. (2014). Atlanta Regional Transportation Plan. Atlanta, GA.

STEP 4.1.4	<p>Document the process</p>
	<p>It also can be a sort of menu, showing the many areas in need of funding that must be balanced. The first row represents the general program area and colors indicate performance areas, with system preservation in green, congestion/mobility in blue, and other in dark blue. Projects are then divided into the appropriate plans and programs with increasing detail, leading to KDP 4 where the program is finalized for each project type. For more, visit the Plan 2040 site at http://www.atlantaregional.com/transportation/regional-transportation-plan/rtp-chapters-and-appendices.</p>
<p>Linkages to Other TPM Components</p>	<p>Component 05: Monitoring and Adjustment (See TPM Framework)</p> <p>Component 06: Reporting and Communication</p>

4.2 PROGRAMMING ACROSS PERFORMANCE AREAS

Performance-Based Programming also addresses allocation and prioritization processes across performance areas. As discussed in the Introduction, though this is an emerging practice, some agencies have well-developed frameworks for this process. Implementation steps are:

1. Identify and assign internal roles and responsibilities
2. Clarify purpose of cross performance area prioritization
3. Develop a methodology that reflects agency priorities and external stakeholder interests
4. Document the process

Although not specified as a step, Programming Across Performance Areas requires development of project selection criteria similar to Programming Within Performance Areas (refer to step 4.1.2 “Develop project selection criteria”).

“The ability to apply the framework...depends on an agency’s organization structure and maturity with respect to performance-based planning, asset management, needs identification, and performance management.”

Source: NCHRP Report 806, Cross-Asset Resource Allocation

STEP 4.2.1	Identify and assign internal roles and responsibilities
<p>Description</p>	<p>Because across performance area programming is not yet common practice, it is critical for the agency to clearly define roles and responsibilities for completing the process. Adjustments to the way programming has previously been done will likely encounter resistance for a number of reasons, including worries over the potential for reduced allocations on the part of particular performance area staff, concern over increased workloads due to project submission and scoring, and skepticism about the assessment tool/methodology to be employed. These are all valid concerns, and should be addressed openly from the beginning to ensure support among staff. To establish a process that will be used on a continuing basis to drive investments, staff must feel that the new way of doing things is useful, worth any extra work required, is responsive to their input, and respects existing processes.</p> <p>It is also important that senior managers and executives express support for this initiative. While establishing an inclusive process will bring some staff on board, some will remain resistant. Executive support will ensure this group continues to support the effort even while they are not convinced of its merits.</p> <p>Roles to define include:</p> <ul style="list-style-type: none"> • Project curator – who will facilitate project submissions? • Criteria selection team – who will develop criteria by which projects will be evaluated for inclusion in the STIP or TIP? • Data reporters – who is responsible for reporting data that will be used to assess projects? • Analysts—who will evaluate the potential projects based on the criteria? Determination of what methodology will be used? • Decision maker—who will finalize and approve the selection of projects? • Liaison – who will communicate progress to the agency as a whole and gather feedback from those not intimately involved in process development?

STEP 4.2.1

Identify and assign internal roles and responsibilities

Examples

House Bill 2 in Virginia directs the Commonwealth to establish an objective process to score projects for funding to ensure that the budget allocation process is transparent to the public and that the most strategic projects are chosen. The Commonwealth Transportation Board (CTB) is an 18-member group including district representatives, the Secretary of Transportation, the Director of the Department of Rail and Public Transportation, and the Director of the Department of Transportation. The CTB allocates funding to specific projects for all transportation projects in the state; because of HB2, the Board will now use an objective project scoring system to program projects.

The HB2 Implementation Policy Guide²⁴ documents eligible projects and the scoring process; it also defines roles and responsibilities:

Table 4-5: HB2 Implementation and Responsibilities

Source: HB2 Implementation Policy Guide²⁵

Group	Roles and Responsibilities
Commonwealth Transportation Board	<ul style="list-style-type: none"> Oversees project evaluation process Uses the project evaluations to inform funding decisions Not required to fund highest-scoring projects, but must be able to justify decisions if not consistent with evaluation scoring
Office of the Secretary of Transportation	<ul style="list-style-type: none"> Manages the project application process Includes Office of Intermodal Planning (OIP), Department of Rail and Public Transportation (DRPT), and Virginia Department of Transportation (VDOT) OIP screens and reviews projects against HB2 screening criteria to determine eligibility to compete in evaluation process VDOT and DRPT determine ratings for each project The Secretary of Transportation’s Office provides the final evaluation to CTB and to the public
Technical Evaluation Team	<ul style="list-style-type: none"> Responsible for conducting measure calculations and creating the qualitative rating assessments for each factor for each submitted project Comprised of technical staff from DRPT and VDOT that have experience with subject matter and analytical tools Evaluate project preparation Calculate scores for submitted projects according to methodologies documented in the Implementation Guide Allows second team to evaluate to ensure consistency
External Peer Review	<ul style="list-style-type: none"> Comprised of representative from Virginia Association of Counties, Virginia Municipal League, FHWA, and other groups Review projects, evaluations, and scores to ensure consistency

²⁴ HB2 Implementation Policy Guide. August 1, 2015. http://www.virginiahb2.org/documents/hb2policyguide_8-1-2015.pdf

²⁵ HB2 Implementation Policy Guide. August 1, 2015. http://www.virginiahb2.org/documents/hb2policyguide_8-1-2015.pdf

STEP 4.2.1

Identify and assign internal roles and responsibilities

Massachusetts Department of Transportation

Section 11 of Chapter 46 of the Acts of 2013 established a Project Selection and Advisory Council (the Council) charged with developing uniform project selection criteria.²⁶ The Council is comprised of representatives from key external stakeholders such as MPOs, RTAs, municipalities, advocacy organizations, and others. The mission of the Council states:

With due consideration of the requirements of fiscal constraint, federal funding restrictions, regional priorities, geographic equity, environmental justice and state of good repair, and in a manner that balances the need for responsive and transparent adaptability to unanticipated changes in funding, project readiness or in the event of an emergency or public safety need, the Project Selection Advisory Council, as established by the Massachusetts Legislature in Section 11 of Chapter 46 of the Acts of 2013, seeks to review existing statewide project evaluation criteria and prioritization processes for Massachusetts’ multi-modal transportation system. The PSA Council will recommend changes for a more uniform, transparent and data-driven prioritization process that reflects MassDOT’s mission to provide our nation’s safest and most reliable transportation system to strengthen our economy and quality of life across the Commonwealth.

Over an 18-month period, the Council met regularly and consulted with the public and legislature. On July 1, 2015, “Recommendations for MassDOT Project Selection Criteria” was delivered, focusing primarily on modernization and capacity projects. The project selection criteria defined in this effort is illustrated below.

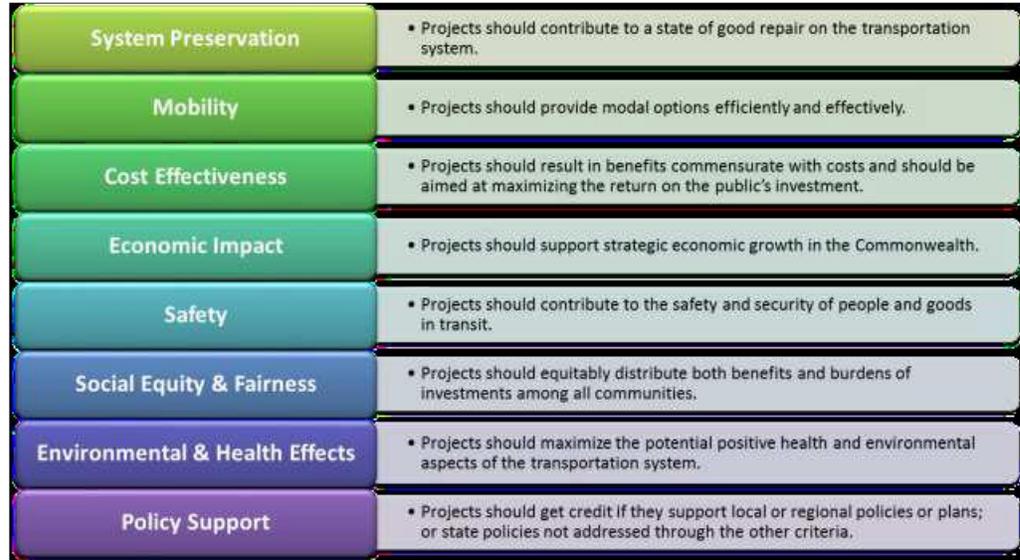
²⁶ Massachusetts Department of Transportation. (2015). Recommendations for MassDOT Project Selection Criteria. Boston, MA. https://www.massdot.state.ma.us/Portals/0/docs/PSAC/Report_Recom.pdf

STEP 4.2.1

Identify and assign internal roles and responsibilities

Figure 4-9: MassDOT Project Selection Criteria

Source: Recommendations for MassDOT Project Selection Criteria²⁷



Maryland Transit Administration

The Maryland Transit Administration (MTA) is one of the modal administrations within the Maryland Department of Transportation and has developed an in-house Excel-based spreadsheet tool to prioritize projects across performance areas. The Programming Office within MTA requests project submissions from across the agency, and then distributes the list of projects to seven Deputy Chiefs, along with senior staff representing operations, engineering, administrative support, planning, and safety. Each Deputy Chief initially ranks each project on a one to three scale based on the perspective of their performance area and then the group meets to discuss variations in the assessments. Once scoring is complete, projects are entered into the decision matrix tool and results are provided to agency leadership to assist in making funding decisions.

Linkages to Other TPM Components

Component A: Organization and Culture (See TPM Framework)

STEP 4.2.2

Clarify purpose of cross performance area prioritization

Description

Agencies take different approaches to cross performance area programming based on particular circumstances. In some agencies with more developed project selection and funding allocation, methodologies for specific performance areas may decide that such projects will not be subject to cross-area prioritization because the process is data driven and is producing

²⁷ Massachusetts Department of Transportation. (2015). Recommendations for MassDOT Project Selection Criteria. Boston, MA. https://www.massdot.state.ma.us/Portals/0/docs/PSAC/Report_Recom.pdf

<p>STEP 4.2.2</p>	<p>Clarify purpose of cross performance area prioritization</p>
	<p>good results. However, if an agency finds that it is not achieving desired results under its current regimen, this should be reconsidered. Other agencies may want to include all projects regardless of how data-driven later programming is.</p> <p>Whichever approach is chosen, it must be clearly documented which project types will and will not be evaluated using this process. The purpose of the prioritization should be stated and clearly communicated to all involved, including any agencies that will submit a project for funding.</p> <p>In addition, the agency should clearly document why this new approach is necessary, for example:</p> <ul style="list-style-type: none"> • Virginia Department of Transportation: <ul style="list-style-type: none"> ○ Increase transparency and accountability for project selection and to make the process objective ○ Improve stability in the Six-Year Improvement Program • MassDOT: <ul style="list-style-type: none"> ○ Invest in transportation needs to build public confidence ○ Maximize return on investment in terms of traditional economic ROI but also in terms of quality of life and sustainability ○ Address significant backlog ○ Deal with acute funding constraints • NCDOT: <ul style="list-style-type: none"> ○ Increase transparency of process ○ Remove politics from transportation decision-making (strong public desire) • Maryland Transit Administration: <ul style="list-style-type: none"> ○ Provide a common set of performance-based criteria to assess a range of assets (e.g., vehicles, infrastructure, stations, maintenance facilities) ○ Reflect political and legal mandates while also highlighting MTA’s strategic direction (e.g., exceptional customer service) • Delaware Valley Regional Planning Commission <ul style="list-style-type: none"> ○ Apply universal criteria that can evaluate a variety of modes (roadway, transit, bike, pedestrian and freight) to provide the means to effectively balance programming of the region’s needs and resources. <p>Once the universe of eligible projects has been determined and the purpose of the cross-area prioritization has been determined, the agency must determine how projects will be evaluated. Project selection criteria based on particular measures will help an agency achieve an objective, data-driven process. Using existing data will be most expedient, but additional measures can be added or substituted in future iterations of project scoring. Refer to Implementation Step 4.1.2, “Develop project selection criteria,” for further information.</p>
<p>Examples</p>	<p>The Massachusetts Department of Transportation developed a project prioritization framework for cross-asset allocation. The group in charge of developing this policy debated at length over what project types would be subject to prioritization, determining that two project categories (Modernization and Capacity) would be included. Asset management and basic state of good repair projects would not be included if they underwent rigorous prioritization within the asset silo. Asset management projects not subject to this sort of review would be</p>

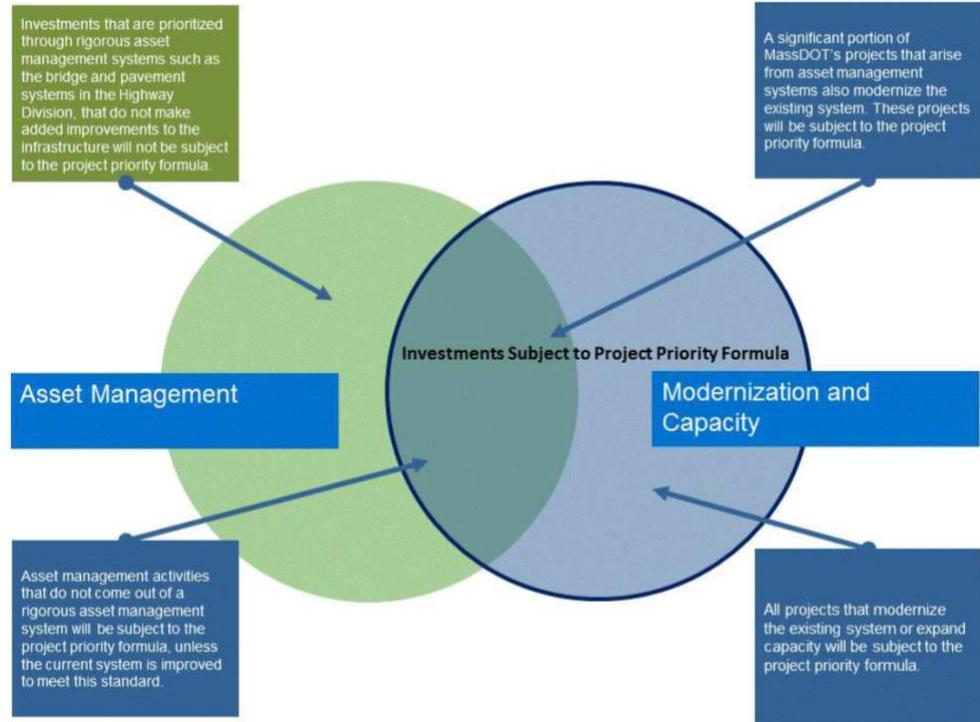
STEP 4.2.2

Clarify purpose of cross performance area prioritization

included in the new prioritization process. The graphic below demonstrates this point. Blue boxes show projects to be included in the prioritization process and explain the rationale behind this decision.

Figure 4-10: MassDOT Prioritization Process

Source: Recommendations for MassDOT Project Selection Criteria²⁸



MassDOT chose to exclude basic asset management projects from project prioritization because many of these projects have straightforward scopes and predictable impacts on performance, making comparison to other projects less useful. However, the agency does acknowledge that there is a need to prioritize these projects in some way because funding consistently falls short of need. To this end, the agency decided that mature asset management systems would continue to be used as-is to prioritize projects (green box). Those projects that go beyond asset management to modernize or add capacity are subject to prioritization through this new system (blue boxes on right).²⁹

Linkages to Other TPM Components

Component B: External Collaboration and Coordination (See TPM Framework)
 Component 05: Monitoring and Adjustment
 Component 06: Reporting and Communication

²⁸ Massachusetts Department of Transportation. (2015). Recommendations for MassDOT Project Selection Criteria. https://www.massdot.state.ma.us/Portals/0/docs/PSAC/Report_Recom.pdf

²⁹ Massachusetts Department of Transportation. (2015). Recommendations for MassDOT Project Selection Criteria. https://www.massdot.state.ma.us/Portals/0/docs/PSAC/Report_Recom.pdf

STEP 4.2.3

Develop a methodology that reflects agency priorities and external stakeholder interests

Description

In this step a methodology is developed that reflects the goals of the agency and its stakeholders. Prior to performing this step the agency should have already spelled out its priorities by establishing goals in the Strategic Direction (Component 01). Now the agency goes further, and prioritizes candidate investments based on the degree to which they support the agency’s goals.

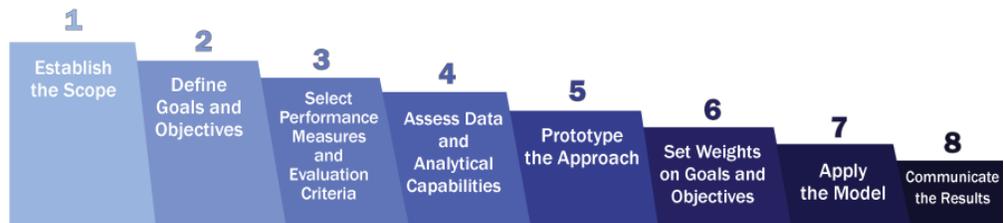
To perform this step the agency should determine how different performance measures relate to agency goals, and how specifically the data on the performance of a given investment should be used to prioritize. Input from external stakeholders is important to ensure that the priorities established internally by agency staff match as much as possible to areas where partner agencies and the public desire improved performance. An agency should seek to gather input on the overall prioritization approach, as well as on the evaluation of specific investments that are prioritized using the approach.

Formal methods for performing this step fall in the domain of Multi-Objective Decision Analysis (MODA), also referred to as Multi-Criteria Decision Making (MCDM). Fundamental concepts regarding how to structure a multi-objective prioritization problem are discussed in Keeney and Raiffa’s [Decisions with Multiple Objectives: Preferences and Value Tradeoffs](#). [NCHRP Report 806. Cross-Asset Resource Allocation and the Impact on System Performance](#) presents a framework for applying MODA to optimizing cross-asset, multi-objective investments in transportation. [NCHRP Report 921, Case Studies in Implementing Cross-Asset, Multi-Objective Resource Allocation](#) updates the NCHRP Report 806 framework, describes a set of case studies, provides supplemental implementation guidance, and documents spreadsheet and web tools for transportation agency use.

Figure 4-11, reproduced from NCHRP Report 921, details a process for implementing a multi-objective prioritization approach. Items 3 to 7 of the process are performed in this step. These include the following:

Figure 4-11: Process for Implementing a Multi-Objective Prioritization Approach

Source: NCHRP Report 921



Select Performance Measures and Evaluation Criteria: for each of the agency’s objectives identify one or more performance measures that will be used to quantify progress. Wherever possible, measures should be quantitative rather than qualitative. Also, it is important to structure measures such that they scale appropriately based on project size. Once measures are selected the agency should determine how they should be used to calculate a score or utility function for each objective. A common approach is to convert measures into a 0-1 score

STEP 4.2.3

Develop a methodology that reflects agency priorities and external stakeholder interests

(0% to 100%) where 0 represents the lowest level of achievement and 1 represents the highest. Alternatively, measures can be scaled such that they are analogous to economic benefits, or dollars.

Assess Data and Analytical Capabilities: determine what data and systems are available for predicting the performance of each of the candidate investments being prioritized. Often a mix of direct measurements, predictive models, representative default values and subjective judgements are used to characterize the performance of candidate investments. One possible outcome of the assessment is that the agency must revisit the analysis scope and measures, and/or collect more data.

Prototype the Approach: next it is recommended that the agency test the prioritization approach to evaluate the feasibility of the approach, the degree to which the results reflect the agency’s goals for implementing a structured prioritization process, and the systems the agency will need to support the approach. Prototyping the approach requires collecting data for a sample set of projects, calculating a score or utility for each project, prioritizing the sample set, and then reviewing and assessing the results. Often an initial test can be performed using a spreadsheet or one of the prototype tools detailed in NCHRP Report 921. Prototyping the approach may result in further changes to the approach based on the outcomes of the prototyping.

Set Weights on Goals and Objectives: once the prioritization process is firmly established, and before it is put into practice, the agency should set weights on any qualitatively-determined prioritization factors. For instance, often the prioritization process results in a 0-1 score for each objective. An overall score is then obtained by multiplying the score for each objective by a weight and summing the weighted scores. Where such an approach is used the specific weights used for each objective can be determined using the Analytical Hierarchy Process (AHP). This process relies on pairwise comparison of each objective to calculate a weight. Alternatively, the agency may use the Delphi process to reach consensus on the set of weights to use. Note that depending on the specific prioritization approach, it may or may not be necessary to set explicit weights. If the process involves converting all measures to monetary equivalents or utilizes a nonparametric approach such as Data Envelopment Analysis (DEA) then setting weights on each objective is unnecessary.

Apply the Model: finally, the approach is used to prioritize across program areas. This involves identifying candidate investments consistent with the scope established in Step 4.2.2., calculating measures for each candidate, and prioritizing using the weights determined as described above.

<p>STEP 4.2.3</p>	<p>Develop a methodology that reflects agency priorities and external stakeholder interests</p>
	<p>Typically, the priorities established are used to inform the decision-making process, but the final decision concerning what investments to pursue is made considering additional factors not formally addressed in the analysis. For instance, often a structured prioritization process assumes a single budget constraint, as well as a single-period decision. In reality, transportation agencies pay for investments over a period of multiple funding periods and may need to consider a number of complex funding program rules. Also, it may be difficult to incorporate all of the factors that motivate a given investment into a structured process, particularly regarding issues such as risk, criticality, and equity. An additional tradeoff analysis, in which results are generated assuming a range of different budget constraints, can help illustrate performance impacts resulting from varying funding levels and provide additional insights to agencies as they finalize their investment decisions.</p> <p>Note: prototype tools for supporting the process described above are described in NCHRP Report 921. AASHTO is maintaining the web tool developed through this research. This tool is available at http://multiobjective.org/.</p>
<p>Examples</p>	<p>Maryland Department of Transportation (MDOT)</p> <p>The Maryland Open Transportation Investment Decision Act – Application and Evaluation³⁰ enacted in 2017 requires MDOT to rank major capital transportation projects considering a set of 23 measures organized into nine goals. As described in NCHRP Report 921, MDOT formed a cross-functional team of MDOT staff and local partners to help implement the law. MDOT conducted a series of workshop to determine evaluation criteria for each of the 23 measures. In some case the measures are determined through direct measurement, while in other the measures are estimated through predictive models (e.g., travel demand forecast) or based on expert judgement. Scores for each measure are converted to a 0-1 scale and combined to calculate 0-1 scores for each goal. In the final workshop MDOT used the Delphi process to establish weights on each of the nine goals. The resulting weights are shown in Figure 4-12.</p>

“This is not a mechanical process – scores influence decisions but do not dictate them. If the project has a high score, an agency is not forced to fund it. However, if a project has a low score and an agency wants to fund it, than the sponsor needs to come up with a solid justification.”

- Ron Achelpohl, Mid-America Regional Council

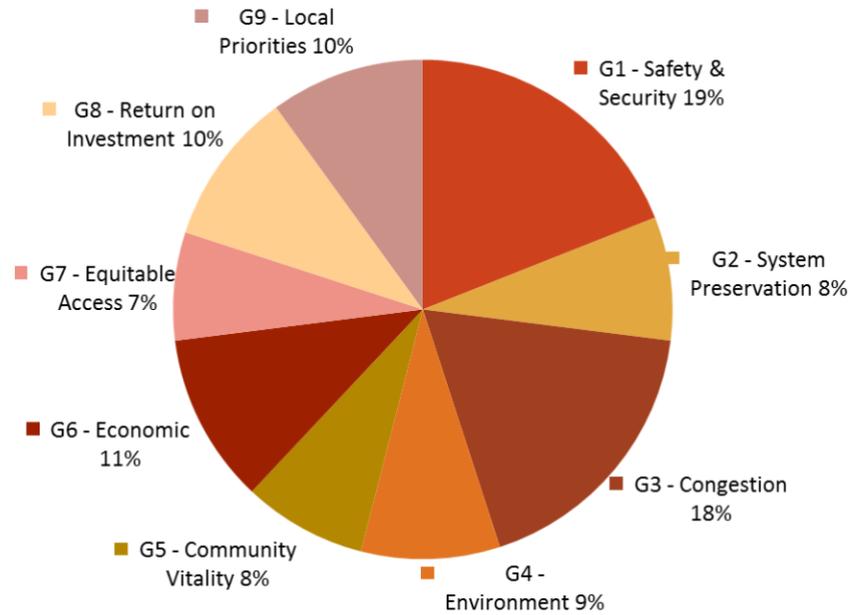
³⁰ Maryland Code – Transportation § 2-103.7. <http://mgaleg.maryland.gov/webmga/frmStatutesText.aspx?article=gtr§ion=2-103.7&ext=html&session=2020RS&tab=subject5>.

STEP 4.2.3

Develop a methodology that reflects agency priorities and external stakeholder interests

Figure 4-12: MDOT Weights by Goal

Source: NCHRP Report 921



MDOT has used the prioritization approach to inform the selection of major capital investments annually since 2018. MDOT has published a technical guide³¹ detailing the prioritization approach, and developed a web site for Maryland state, county and local agencies and municipalities to use to nominate projects.

North Carolina Department of Transportation

The Strategic Transportation Investments Law passed in 2013³² establishes the Strategic Mobility Formula, which creates a data-driven scoring method for allocating resources. The formula takes into account local input from MPOs, RPOs, and Divisions to evaluate projects after all have been given quantitative scores based on established measures related to crashes, pavement condition, travel time savings, and others. Two of three project categories (Division Needs and Regional Impact) are scored with local input according to the formula:

$$\text{Total} = \text{Quantitative Data} + \text{Local Input}$$

The third project category (Statewide Mobility) is based entirely on data. Each organization receives an equal number of points to distribute among the total projects under evaluation and can choose two methods:³³

³¹ MDOT, Chapter 30 Transportation Project-Based Scoring Model: 2019 Technical Guide. http://www.mdot.maryland.gov/newMDOT/Planning/Chapter_30_Score/Images_and_Documents/FY%202019%20Chapter%2030%20Technical%20Guide.pdf.

³² NCGS § 136-189. <http://www.ncleg.net/Sessions/2013/Bills/House/PDF/H817v10.pdf>

³³ NCDOT Strategic Planning Office Presentation. <http://www.ncdot.gov/download/performance/prioritization2jan2012.pdf>

STEP 4.2.3

Develop a methodology that reflects agency priorities and external stakeholder interests

Table 4-6: Two Methods for Project Evaluation

Source: Adapted from NCDOT Strategic Planning Office Presentation³⁴

Method	Top 25	Control Total
Description	#1 = 100 #2 = 96 #3 = 92 ... #25 = 4	Can rank projects as desired Maximum 100 points per project Minimum 4 points per project

By ranking the organization’s top 25 desired projects, the final list can be easily communicated to the public and other stakeholders less familiar with the project; the Control Total alternative provides an opportunity for more fine-tuning. Both methods use the same number of total points. MPO/RPO evaluation is based on the particular organization’s methodology to rank and prioritize projects internally and Divisions use knowledge of the area to assist in their ranking.

The Virginia Department of Transportation prioritized agency goals differently for different parts of the state by creating Area Typologies. The table demonstrates how goal priorities vary by Typology. The map of typologies, available at <http://www.virginiahb2.org/about/>, shows what Typology applies to particular locations. This approach allows the state to focus on the most important needs in particular areas, ensuring that the most appropriate projects are selected to impact the most pressing issues of those areas.³⁵

VDOT also created a separate category called High Priority Projects, which includes projects that address designated Corridors of Statewide Significance or Regional Networks. These are the most important projects in the state according to agency priorities.

Table 4-7: VDOT Area Typologies

Source: Adapted from About HB2³⁶

Factor	Congestion Mitigation	Economic Development	Accessibility	Safety	Environmental Quality
Category A	45%	5%	15%	5%	10%
Category B	15%	20%	25%	20%	10%
Category C	15%	25%	25%	25%	10%
Category D	10%	35%	15%	30%	10%

The Delaware Valley Regional Planning Commission developed nine universal criteria to evaluate projects to be added to the Transportation Improvement Program (TIP). The criteria were defined through a collaborative process with Pennsylvania and New Jersey members of a

³⁴ NCDOT Strategic Planning Office Presentation. <http://www.ncdot.gov/download/performance/prioritization2jan2012.pdf>

³⁵ About HB2. June 9, 2016. <http://www.virginiahb2.org/about/>

³⁶ About HB2. June 9, 2016. <http://www.virginiahb2.org/about/>

STEP 4.2.3

Develop a methodology that reflects agency priorities and external stakeholder interests

working subcommittee of the DVRPC Regional Technical Committee (RTC) and included staff from the State DOTs, transit agencies and bicycle and pedestrian representatives. The selected criteria were designed to align directly with the multimodal goals of the *Connections 2040 Plan*, the region’s long-range plan, and reflect the increasingly multimodal nature of the TIP.

The following characteristics were used to define the benefit criteria:

- Align with the Long-Range Plan and other regional objectives;
- Be relevant to different types of TIP projects;
- Indicate differences between projects;
- Avoid measuring the same goal(s) multiple times;
- Cover the entire nine-county region;
- Be more quantitative than qualitative;
- Use readily available data with a strong likelihood of continued availability; and
- Be simple and understandable

The resulting eight criteria were used to evaluate all TIP projects regardless of mode. This enabled DVRPC to uniformly communicate the benefits of the projects contained in the TIP. What was customized for the different modes was the specific measure used for each criterion. For example, below are the transit, roadway and bridge measures used for the “Facility/Asset Condition” criterion:³⁷

Figure 4-13: DVRPC Facility and Asset Criteria

Source: FY 2015 Transportation Improvement Program, Appendix D³⁸

Facility / Asset Use	Daily VMT	Roadway Management System (RMS),	1 point if the average AADT of all road segments multiplied by the total length of the segments within the project limits is more than 500,000; else total daily VMT divided by 500,000. For computation of VMT, projects that only involve bridges or intersections assume that each of these facilities is 1 mile in length. In this case the value will be the average AADT multiplied by the number of bridges or intersections. Projects where bridge or intersection improvements are a part of a larger scope will rely on the limits of the larger project.
	Daily Trucks	Roadway Management System (RMS),	1 point if the average road segment has more than 7,500 trucks or truck equivalents per day; else trucks or truck equivalents per day divided by 7,500.
	Daily Transit Riders	Transit Agencies,	1 point if the number of daily transit riders affected is 50,000 or above; else daily affected ridership divided by 50,000.

After defining the “benefit criteria,” the submitting agency evaluated each project submitted to the TIP. It should be noted that the eight benefits criteria were not used to identify projects to exclude from the TIP. Instead, the criteria created a common language for each submitting agency to describe the benefits of their set of TIP projects. The criteria development process and resulting criteria were documented in the FY 2015 TIP, but the score and ranking of the TIP projects were not publicly released.

DVRPC uses the benefit criteria to communicate why these projects were necessary for the region to attain its multimodal goals.

Linkages to Other TPM Components

Component B: External Collaboration and Coordination
Component C: Data Management

³⁷ Delaware Valley Regional Planning Commission. *FY 2015 Transportation Improvement Program, Appendix D.* <http://www.dvrpc.org/TIP/pafinal/2015/DVRPC-TIP-Project-Benefit-Criteria-2015.pdf>

³⁸ Delaware Valley Regional Planning Commission. *FY 2015 Transportation Improvement Program, Appendix D.* <http://www.dvrpc.org/TIP/pafinal/2015/DVRPC-TIP-Project-Benefit-Criteria-2015.pdf>

STEP 4.2.3	Develop a methodology that reflects agency priorities and external stakeholder interests
	Component D: Data Usability and Analysis (See TPM Framework)
STEP 4.2.4	Document the process
<p>Description</p>	<p>Documentation is a critical part of every process in this guidebook, and this remains true for cross-performance area programming. Because this process is heavily dependent on data, scoring, measures, and various priorities, it is extremely important to document. In addition, many agencies choose to implement this process as part of an effort to increase transparency related to project funding and budget allocation; without proper documentation, the process will still seem like a black box.</p> <p>In addition to documenting how the process was established and conducted, the agency must document:</p> <ul style="list-style-type: none"> • Project selection criteria and how they were determined • Formulas for project evaluation and justification behind the approach • Why certain goal areas were prioritized • Impacts on performance from tradeoff analyses • What alternatives were not chosen and why • Roles and responsibilities • Project eligibility • Project submission process • Timeline for submission, evaluation, and publication of final results • Input received from external stakeholders • Risk factors that may impact program delivery and effectiveness • Output targets that can be used to track anticipated effects of projects
<p>Examples</p>	<p>The North Carolina DOT publicly documents scores given to each project evaluated through the cross-area performance prioritization process. The image below is a very small portion of the file posted online at: https://connect.ncdot.gov/projects/planning/STIData/Forms/AllItems.aspx. The Excel files are available for download and include project information, cost, and evaluative scores by partner agencies as well as the quantitative scores given by NCDOT. Making this wealth of information available goes a long way toward increasing transparency of the programming process.</p>

STEP 4.2.4

Document the process

Figure 4-14: NCDOT Prioritization Scoring

Source: Planning – STI Data³⁹

Statewide Mobility Quantitative Score (Out of 100) ▾	Regional Impact Quantitative Score (Out of 70) ▾	Division Needs Quantitative Score (Out of 50) ▾
N/A	N/A	11.20
N/A	9.76	7.33
43.56	30.20	20.84
N/A	10.38	7.32
N/A	23.06	16.68

The **Virginia DOT** clearly documents cross-performance area programming. The table below lists some of the measures that are used to evaluate projects, organized by goal area. It also indicates how each measure contributes to the overall performance area score. This information is available on a publicly accessible website for ease of use and understanding: <http://www.virginiahb2.org/about>.

Table 4-8: VDOT Documentation

Source: Adapted from About HB2⁴⁰

Performance Area	Measure	Contribution
Safety	Number of fatal and injury crashes	50%
Safety	Rate of fatal and injury crashes	50%
Congestion Mitigation	Person throughput	50%
Congestion Mitigation	Person hours of delay	50%
Accessibility	Access to jobs	60%
Accessibility	Access to jobs for disadvantaged persons	20%
Accessibility	Access to multimodal choices	20%
Environmental Quality	Air quality and environmental effect	50%
Environmental Quality	Impact to natural and cultural resources	50%

³⁹ Planning – STI Data. June 9, 2016. <https://connect.ncdot.gov/projects/planning/STIData/Forms/AllItems.aspx>

⁴⁰ About HB2. June 9, 2016. <http://www.virginiahb2.org/about/>

STEP 4.2.4

Document the process

**Linkages to Other
TPM Components**

Component A: Organization and Culture

(See TPM Framework)

Component 05: Monitoring and Adjustment

Component 06: Reporting and Communication

RESOURCES

Resource	Year	Link
<i>TPM Toolbox</i>	2016	www.tpmtools.org
<i>Performance Based Planning and Programming Guidebook</i>	2013	http://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook/
<i>NCHRP 806: Guide to Cross-Asset Resource Allocation and the Impact on Transportation System Performance</i>	2015	http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_806.pdf
<i>Risk-Based Transportation Asset Management: Evaluating Threats, Capitalizing on Opportunities</i>	2012	http://www.fhwa.dot.gov/asset/pubs/hif12035.pdf
<i>FHWA Scenario Planning Guidebook</i>	2011	http://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/scenario_planning_guidebook/
<i>Defining Cross-Asset Decision Making: A Discussion Paper</i>	2015	http://www.tam-portal.com/wp-content/uploads/2016/01/Cross-Asset-Allocation.pdf
<i>NCHRP 921: Case Studies in Implementing Cross-Asset, Multi-Objective Resource Allocation</i>	2019	http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_921.pdf
<i>Decisions with Multiple Objectives</i>	1993	http://www.cambridge.org/core/books/decisions-with-multiple-objectives/DEF338459C327778C3F8C4C4A682032F
<i>Flexible Funding for Highway and Transit</i>	Ongoing	http://www.fta.dot.gov/grants/12867.html

ACTION PLAN

1. Of the TPM subcomponents discussed in this chapter, which one would you like to work on?
 4.1 Programming Within Performance Areas 4.2 Programming Across Performance Areas

2. What aspect of the TPM process listed above do you want to change?

3. What “steps” discussed in this chapter do you think could help you address the challenge noted above?

Programming Within Performance Areas

- Clarify roles of internal staff and external stakeholders
- Develop project selection criteria
- Establish a formal input process to gather performance-based project information
- Document the process

Programming Across Performance Areas

- Identify and assign internal roles and responsibilities
- Clarify purpose of cross performance area prioritization
- Develop a methodology that reflects agency priorities and external stakeholder interests
- Document the process

4. To implement the “step” identified above, what actions are necessary, who will lead the effort and what interrelationships exist?

Action(s)	Lead Staff	Interrelationships

5. What are some potential barriers to success?

6. Who is someone (internal and/or external) I will collaborate with to implement this action plan?

7. How will I know if I have made progress (milestones/timeframe/measures)?

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