Asset Management and Management of Highway Performance
Peer Exchange

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16. Abstract

This report summarizes the proceedings of the Asset Management and Management of Highway Performance Peer Exchange hosted by the Federal Highway Administration and the American Association of State Highway and Transportation Officials. The peer exchange was held in Washington, D.C. on August 17, 2009.

The peer exchange aimed to continue the dialog on the details of establishing performance measures and setting targets for pavement and bridge preservation. Building on the strengths of asset management practices related to these assets can help to guide performance management discussions in other transportation goal areas. The discussions at the peer exchange may also help to inform subsequent work on the next Federal transportation reauthorization bill.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	$candela/m^2$	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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1.0 Introduction

This report summarizes the proceedings of the *Asset Management and Management of Highway Performance Peer Exchange* hosted by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO). The peer exchange was held in Washington, D.C. on August 17, 2009.

Transportation asset management is a set of guiding principles and best practice methods for making informed resource allocation decisions, and improving accountability for these decisions. Performance measures are a fundamental building block of any asset management effort. Looking beyond asset management, there is significant interest at the Federal and state levels in improving the transparency and accountability of all types of transportation investment decisions. Towards that end, a number of organizations and agencies, including FHWA, AASHTO, and the U.S. Congress, state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) are working to establish more performance-based transportation programs. While the details of each group's approach may differ, the overall goals of these efforts are consistent:

- Improve the performance of the nations' transportation infrastructure;
- Provide for greater accountability in the decision-making process;
- Make the best use of limited resources; and
- Ensure the long-term economic vitality of the nation.

Discussions regarding performance-based transportation programs have largely been organized around goal areas (e.g., preservation, safety, congestion, etc.). While existing data resources and analysis capabilities differ significantly between the goal areas, the state of practice is relatively more advanced in preservation and safety then in the others. This peer exchange aimed to continue the dialog on the details of establishing performances measures and setting targets for pavement and bridge preservation. Building on the strengths of asset management practices related to these assets can help to guide performance management discussions in other transportation goal areas. The discussions at the peer exchange may also help to inform subsequent work on the next Federal transportation reauthorization bill.

1.1 PEER EXCHANGE FORMAT

A list of peer exchange participants is presented in Table 1.1. Unlike typical peer exchanges where agencies present their experience related to a particular topic, the *Asset Management and Management of Highway Performance Peer Exchange* focused less on presentations and more on lively roundtable discussions.

Following brief presentations on the status of ongoing performance management work by the U.S. House of Representatives Transportation and Infrastructure Committee, FHWA, and AASHTO, the peer exchange agenda consisted of facilitated discussions covering five topics:

1. Performance measures for pavements and bridges;
2. Target setting for pavements and bridges;
3. Performance measures for other transportation goal areas;
4. Implications for planning and programming; and
5. Implementation.

Table 1.1 Peer Exchange Participants

Participant	Organization
Kelsey Ahern	Cambridge Systematics
Mara Campbell – Director of Organizational Results	Missouri DOT
Wade Casey – Bridge Management Engineer	FHWA
Scott Christie – Deputy Secretary for Highway Administration	Pennsylvania DOT
Judith Corley-Lay – Pavement Analysis Engineer	North Carolina DOT
Paul Degges – Chief Engineer	Tennessee DOT
Charles Dougherty – Director, Technical Services Division	Delaware Valley Regional Planning Commission
Steve Gaj – Team Leader, System Management and Monitoring Team	FHWA
King Gee – Associate Administrator, Office of Infrastructure	FHWA
Joe Guerre	Cambridge Systematics
Randy Halvorson	Cambridge Systematics
Pam Hutton – Chief Engineer	Colorado DOT
Tony Kane – Director of Engineering and Technical Services	AASHTO
Todd Kohr – Director of Highways Policy	U.S. House Transportation and Infrastructure Committee
Jim March – Director, Industry and Economic Analysis Team	FHWA
Michelle Maggiore – Program Director for Planning and Policy	AASHTO
Jim McDonnell – Deputy Program Director for Engineering	AASHTO

Participant	Organization
Kathleen Penney – Chief Engineer	District DOT
Neil Pederson – Administrator	Maryland State Highway Administration
Ken Petty – Planning Capacity Building Team	FHWA
Nastaran Saadatmand – System Management and Monitoring Team	FHWA
Kyle Schneweis – Project Manager	Kansas DOT
Steve E. Simmons – Deputy Executive Director	Texas DOT
Kirk Steudle – Director	Michigan DOT
Pete Stephanos – Director, Office of Pavement Technology	FHWA
Jienki Synn – Planning Oversight and Stewardship Team	FHWA
Kevin Thompson – State Bridge Engineer	California DOT
Thomas Van – Pavement Management Engineer	FHWA
Bobbi Welke – Southwest Region Engineer	Michigan DOT
Butch Wlaschin – Director, Office of Asset Management	FHWA
Francis Ziegler – Director	North Dakota DOT

The open discussion format of the peer exchange allowed for a free flow of ideas among the participants. The remainder of this report summarizes the highlights of these discussions.

2.0 Status of Current Activities

2.1 HOUSE TRANSPORTATION AND INFRASTRUCTURE COMMITTEE

Todd Kohr, Director of Highways Policy for the U.S. House of Representatives Transportation and Infrastructure (T&I) Committee, provided an update on the proposed Surface Transportation Authorization legislation. The current draft legislation calls for a $450 billion program over six years – dramatically more than current funding.[1] To build the case for this level of investment, the T&I Committee has proposed a shift towards to a Federal transportation program that links investment to performance. Centered on the themes of performance and accountability, it is anticipated that the final legislation will specify performance measures and targets and hold funding recipients accountable for investment decisions and the impact that those decisions have on achieving national goals/objectives.

Recognizing that performance management is not a one-size-fits-all approach, the T&I Committee's proposed legislation calls for a partnership between Federal, state, and local governments, and a mixture of Federal and state agency-specific targets. Also, the proposed legislation reflects an understanding that the state of practice in preservation and safety is more advanced than in other goals areas. For example, in the area of preservation, Congress would specify performance measures and set minimum performance thresholds. State DOTs would then work with the FHWA to develop 1) agency-specific targets that are at least as high as the national standards, and 2) an investment strategy for achieving the targets. Accountability would be based on the implementation of the established investment strategy. The legislation would provide flexibility for allocating resources in a manner required to achieve the established targets, and for adjusting the targets in the case of inadequate funding availability or emergencies. In other areas, such as freight, national measures and targets would not yet be established.

The proposed legislation can be found on the T&I Committee's web site, http://transporation.house.gov. The Committee is aware that its proposal is a starting point and invites feedback from the transportation community. One of the outstanding issues relates to the timeframe for implementation. For example,

[1] U.S. House of Representatives Committee on Transportation and Infrastructure, *The Surface Transportation Act of 2009: A Blueprint for Investment and Reform Executive Summary*, Presented by Chairman James L. Oberstar, Ranking Member John L. Mica, Chairman Peter A. DeFazio, and Ranking Member John J. Duncan, Jr., June 18, 2009.

the current draft calls for each state to establish preservation targets within 6 months after the legislation is enacted. Relying on expertise from others, the draft released in June 2009 will continue to be revised and modified in the coming months.

2.2 FHWA

Jim March from the FHWA Office of Policy and Governmental Affairs presented an overview of FHWA's ongoing performance management activities. These activities include:

- **Internal Assessment of Program and Implementation Options –** Recognizing the political imperatives that will likely incorporate performance and accountability into Federal transportation programs. FHWA is conducting an assessment of internal implications associated with implementing a performance-based program.
- **Broad-Based Research Program –** FHWA also is conducting two research studies related to performance management. The first, titled *Framework for Implementing a Performance-Based Federal – Aid Highway Program,* is a short-term effort focused on developing a framework for a performance-based Federal transportation program. The second, titled *Performance-Based Management of Federal-Aid Highway Programs*, has a longer timeline, and will provide more technical details on performance management issues. This effort will include an assessment of performance management in other Federal programs (such as education) and other countries, and explore the relationships between benefit/cost analysis and performance management.
- **Recent International Scan –** FHWA participated in a recent international scan to learn more about how several advanced countries use performance management to achieve performance results (this effort is described in more detail below).
- **Technical Assistance to Congressional Committee Staff –** FHWA provided technical assistance to the House Transportation and Infrastructure Committee staff in drafting the authorization legislation described above and has also provided technical assistance to staff of the Senate Environment and Public Works Committee.
- **Participation in AASHTO Standing Committee on Performance Management –** FHWA participates in the activities of the AASHTO Standing Committee on Performance management and its task forces (these efforts are described in more detail below).

2.3 AASHTO

Tony Kane, AASHTO Director of Engineering and Technical Services, provided an update on AASHTO's Standing Committee on Performance Management (SCOPM), summarized the proceedings of the recent CEO Leadership Forum on performance management, and presented the findings of the international scan on the linkage between transportation performance and accountability.

Standing Committee on Performance Management

The SCOPM is divided into eight task forces, one for each of AASHTO's six goal areas (safety, preservation, congestion, systems operations, environment, and freight/economics) as well as for planning and programming and comparative measures. Kane presented a status report on each task force.

- **Safety –** The Safety Task Force recommends that fatalities (reported as a three or five-year moving average) be used as the safety measure, and that each state set aggressive targets to help achieve a national goal of halving fatalities in two decades, with a long-term vision of zero fatalities.
- **Preservation –** The Preservation Task Force has recommended three measures – present serviceability index (PSI) or remaining service life, international roughness index (IRI), and percent of structurally deficient bridges (weighted average by deck area). While there is discussion of establishing national goals for the Interstate and rest of the National Highway System (NHS), a national goal has not yet been recommended.
- **Congestion –** The Task Force has considered many performance measures related to congestion, but is having difficulty identifying one measure that suits all states.
- **System Operations –** Establishing consensus on recommended systems operations measures will require more discussion with the states. However, metrics, in general, include those that quantify travel time reliability. The System Operations Task Force expects that two or three measures will be desirable. Functional class will be an important consideration to account for the distinction between urban and rural operational differences.
- **Environment –** While work is still underway in this area, the Environment Task Force expects a measure of green house gases (GHG) to be recommended for the environment goal area.
- **Freight/Economics –** The Freight/Economics Task Force is considering several candidate measures. However, the measures and measurement techniques require additional refinement before recommendations can be made.
- **Planning and Programming –** The Planning and Programming Task Force is developing a definition of performance-based planning and programming that aims to deliver on the targets set at the national and state levels. This Task Force will develop a draft methodology that will revolutionize the

current multimodal long-range planning and short-range programming processes of state DOTs and MPOs to deliver programs that will make progress toward achieving national (and state) goals and objectives.

- **Comparative Measures –** The Comparative Measures Task Force will publish comparative reports on pavement and safety shortly. Additional results on bridges and incident management will be available early 2010. Development of comparable measures in the areas of congestion, environment, and freight/economics, as well as emerging areas like livability and sustainability, still requires considerable effort.

CEO Leadership Forum on Performance Management

In April 2009, AASHTO, FHWA, and the Transportation Research Board (TRB) sponsored a CEO Leadership Forum on Performance Management at the University on Minnesota Center for Transportation Studies. The purpose of the event was to exchange best practices and experiences in performance management, identify strategic challenges, and develop research and action plans. Based on the Forum discussion and results of a survey conducted prior to the Forum (Table 2.1), there was consensus among Forum participants that states are ready to implement performance measures for pavements, bridges, and safety, but less ready in other areas. A report summarizing the Forum proceedings, including presentations and resulting action plans, will be published shortly.

Table 2.1 Prevalence of Performance Targets
Results of CEO Forum Survey

Goal Area	Measures Only	Measures and Targets	Neither
Preservation	3	17	1
Freight/Economics	6	1	14
Safety	4	17	0
Congestion	8	9	4
System Operations	6	9	6
Environment	5	7	9

Source: Cambridge Systematics, Inc.

2.4 LINKING TRANSPORTATION PERFORMANCE AND ACCOUNTABILITY: INTERNATIONAL SCAN

In the summer of 2009, a panel of United States transportation professionals traveled to Sweden, the United Kingdom, Australia, and New Zealand to learn how these countries have incorporated performance management into their surface transportation programs.

The scan team found asset management to be an integral part of transportation programs in each country visited. Asset management is considered a viable model for managing pavement, bridges, safety features, and traffic hardware, as well as for operating highways (e.g., maintaining average journey to work time or reliability of the system). The scan team identified several examples of asset management tools and techniques that can potentially inform practices in the United States. These include more inclusive costs and benefits in benefit/cost analysis and "value for money" analysis; greater reliance on economic/financial accounting techniques by transportation agencies during discussions with treasury departments; and the use of risk analyses to make investment tradeoffs between and within asset classes.

Overall, the scan team found that performance management is an accepted, but evolving approach to the business of transportation. In each country accountability through performance measures have been built into the transportation program. In every case, performance management followed a learning curve that resulted over time in fewer measures and in more emphasis being given to performance trends rather then specific targets. A full report of the scan findings will be published shortly.

3.0 Peer Exchange Discussions

The original intent of the peer exchange was to focus on the technical details of performance measures and the target-setting process. However, given the potential implications of a performance-based program in terms of agency accountability and the allocation of transportation resources, the discussions quickly moved to broader policy-level issues. Several overarching themes emerged from these discussions:

- There is an important distinction between performance-driven decisions and performance-influenced decisions. Performance measures are not the end result. The end result is the ability to show that transportation investments decisions are being made with an understanding of their implications on system performance and established goals. This is a critical point because it underscores the importance of the transportation planning and programming process as the vehicle to deliver on desired outcomes.
- When establishing performance measures and targets, it is important to be clear about which portions of the network (Interstate, NHS, functional class, etc.) are being reported on and which will be considered in target setting. An important first step in the development of a national performance management framework is to identify those assets that are of national importance.
- Establishing a national performance-based program must take into account the differences between the nation's urban and rural areas. Each area may require a unique set of performance measures and/or targets.
- The needs of each state differ and are evolving (e.g., growth versus maintenance). An alternative to holding all states accountable for achieving the same targets, is to require them to develop investment strategies that can be shown to be consistent with national goals, and then to hold them accountable for implementing the agreed-upon strategies. The states participating in the peer exchange felt that this approach would help alleviate many of the concerns and challenges described below.

3.1 PAVEMENT PERFORMANCE MEASURES

Pavement ride quality, as measured by the International Roughness Index (IRI), is the only measure of pavement condition collected by all state DOTs. Given its commonality, IRI is a logical first choice for measuring and reporting pavement performance. However peer exchange participants discussed two significant issues with the use of IRI as a national performance measure – inconsistency in how IRI data are collected and an inability for IRI to be used to understand the overall structural condition of a pavement.

Within a given agency, the participants felt that measurements of IRI tend to be consistent. (A contrasting example was provided the Maryland DOT, which saw overall IRI improve after it purchased a new data collection vehicle.) However they felt that there is less consistency in IRI among state agencies. Examples of sources of discrepancies cited include the use of different equipment to collect IRI data, and different protocols regarding which portions of the highway to included in the measurements (e.g., some states include bridge approaches, others do not). Tightening HPMS reporting requirements over time may help to improve consistency and comparability among states. Given current comparability issues, however, there was discussion on the appropriate data used to measure pavement performance. For example, no consensus was reached on whether pavement performance data should come from the national HPMS database or from state pavement management systems.

The participants agreed that ride quality does not provide a complete picture of pavement condition. They suggested that a measure of structurally adequacy in addition to ride quality would provide a more comprehensive assessment of pavement performance. However, there is no common or consistent measure of structural adequacy used by state DOTs. Some states measure present serviceability (PSR), while others measure remaining service life or combine structural adequacy and ride quality into a single overall measure. Regardless of which performance measures are used to report on pavements, the participants agreed that decisions on pavement investments should be based on the best technical data available, which will vary among states.

3.2 BRIDGE PERFORMANCE MEASURES

Structural deficiency is the most common measure used for reporting bridge condition. The SCOPM Preservation Task Force has recommended percent of structurally deficient bridges, weighted by deck area as a common measure. Unlike many of the other goal areas, the data required to report this is readily available from the National Bridge Inventory (NBI) database.

The peer exchange participants provided the following recommendations regarding the measurement of bridge condition:

- Expand beyond percent structurally deficient bridges (weighted average by deck area) and use a measure that helps to identify deteriorating bridges before they become deficient. Having two thresholds (for example, those required to define the boundary between good, fair, and poor) would allow agencies to develop strategies that combine preventive maintenance, rehabilitation, and reconstruction.
- Consider two measures of structural deficiency – one that includes bridges that are structurally deficient solely because of their deck rating and one that does not. The use of two measures reflects the fact that bridges that are

deficient because of deck area may have a lower priority than bridges with superstructure or substructure deficiencies.

- In addition to percent structurally deficient bridges (weighted average by deck area), consider adding a count of fracture critical bridges as a measure. This measure would result in a different prioritization of bridges then an approach that considered only structural deficiency.

3.3 PAVEMENT AND BRIDGE TARGETS

Defining performance targets is a key step in establishing a performance-based Federal-Aid Highway Program. The peer exchange participants discussed a variety of challenges and offered potential solutions to establishing performance targets for pavements and bridges.

What Should Be the Relationship between National and State Targets?

The discussion of performance targets focused largely on who should be responsible for setting the targets. Should targets be legislated by Congress, set nationally by the U.S. DOT, or individualized by state? While no resolution was reached on this issue, there was significant discussion around the following approach:

- Establish national goals;
- Require states to establish targets and develop an investment strategy for achieving them;
- Require states to illustrate how the investment strategy will help achieve the national goals; and
- Hold states accountable for implementing the strategy.

This approach would place emphasis on a performance-based process (or investment strategy) rather then on specific target values. In the context of preservation, an investment strategy might include the amount of money that will be spent on preventive maintenance, rehabilitation, and reconstruction activities over the next six years. Participants discussed how Strategic Highway Safety Plans could be used a model for other goal areas such as pavement and bridge preservation. They noted similarities between these plans and the approach described above.

What Part of the System Should Be Included in the Targets?

Establishing appropriate national targets requires a recognition of which part of the system is truly in the national interest. Participants suggested that the national highway system (NHS) represents the country's core assets. They also noted that establishing targets for facilities beyond those determined to be of national interest would increase the number of local agencies required to be

vary by highway function or by geography. For example, some states assign higher priorities to roadway that serve as school routes, truck routes or evacuation routes; and establish different performance standards for urban and rural areas.

Should Targets be Based on Trends or Specific Thresholds?

Participants discussed the use of "percent improvement" as the basis for performance targets, with the idea that every year agencies should show steady improvement. However, several participants suggested that while this trend approach works well for safety, a threshold-oriented approach would be preferred for preservation. Establishing a common goal based on specific thresholds for good/fair/poor would provide agencies with the option to maintain a steady state once an adequate level of performance was achieved. It was noted that not all states would need or want to increase the condition of their pavement or bridges after achieving a minimum threshold. In addition, agencies would be less justified in increasing targets once customers are satisfied with the current condition.

How Should Targets Be Used?

Peer exchange participants noted that performance targets hold significant promise for helping agencies communicate what can and can not be accomplished with existing funding levels. They also discussed how targets could be used to help the public and elected officials understand the implications of increasing or decreasing transportation budgets.

However, the participants raised several concerns regarding the potential use of performance targets to influence the allocation of Federal funds. For example, they discussed the importance of equity considerations, and noted potential similarities to previous donor state disputes. They also discussed the potential for unintended consequences such as rewarding agencies that perform poorly. Finally, they noted that additional data improvements and greater confidence in technical models would be needed if targets were to be used as the basis for accountability and funding allocation.

3.4 MEASURING PERFORMANCE IN OTHER GOAL AREAS

Safety

Similar to highway preservation, performance measurement in the safety area is more advanced than the other goal areas. Participants noted that in preparing the required Strategic Highway Safety Plan (SHSP), all states have moved toward a performance-based approach by developing goals and performance measures related to safety. AASHTO's Standing Committee on Highway Traffic and Safety has developed 14 specific safety categories with measures and targets.

AASHTO's SCOPM Safety Task Force has recommended annual fatalities as an appropriate performance measure for assigning a national goal and target.

Based on their earlier discussions related to pavement and bridge performance, peer exchange participants identified the following recommendations for establishing safety performance measures:

- **Less is more.** The international scan found that many safety programs started out very prescriptive, but were relaxed over time. Participants felt a small set of measures would improve the overall success of a performance-based program.
- **Acknowledge differences among the states.** AASHTO will soon be releasing a comparative study of safety in all 50 states. The report highlights differences in state laws, organization structures, and legislative requirements related to safety. Given these differences and the fact that each state would be starting from a different performance baseline, participants suggested that all states should not be held to the same short-term targets.

Congestion

The SCOPM Congestion Task Force has found identifying and building consensus on a set of performance measures to be difficult. Based on the earlier pavement and bridge discussions, participants offered the following recommendations for the congestion goal area:

- **Start by defining which portion of the system is covered.** In establishing the scope of congestion measures, participants noted to the need to consider data and technical capabilities. For example, evaluating congestion on key Interstate corridors would be easier than evaluating congestion on NHS local connectors. They also noted that congestion is a very different issue in urban areas then in rural areas.
- **Provide for flexibility in defining measures.** Participants noted that no two states measure and report congestion the same way. States have varying definitions of congestion, standards on what is acceptable, and motivations for improving or not improving their congestion levels. Therefore, they discussed the potential to use agency-specific measures, rather than look for common national measures.
- **Consider moving away from national targets.** Participants discussed the potential of considering congestion performance at the regional or local level rather then at a national level. They also discussed the idea of focusing on adherence to a performance-based congestion management process, rather than on the achievement of specific measure targets.
- **Incorporate benefit/cost analysis**. Participants discussed the importance of benefit/cost analysis in the congestion management process. They suggested that a performance-based congestion program should encourage agencies to

identify projects that will provide the greatest value rather then focus on a worst-first approach.

System Operations

Although the systems operations goal area covers a wide range of activities and investments such as snow removal, incident management, and intelligent transportation systems (ITS), peer exchange participants noted that that Federal funds are spent primarily on ITS-related projects. As a result, they suggested that national measures for system operations focus on performance results that are affected by this type of investment. Furthermore, since ITS projects are aimed at congestion, some participants wondered if the systems operations goal area should be folded into the congestion goal area.

The participants also noted that Federal operations investments should be targeted to that part of the system that most influences the national interest, such as the Interstate system and/or NHS.

After discussing difficulties related to operations data and analysis (e.g., difficulties in calculating travel time reliability), the conversations focused on the potential for capital investment decisions for systems operations to be based more on benefit/cost analysis then specific performance measures. For example, before making decisions about where to invest capital operations funds, agencies could evaluate the costs and benefits of potential projects in a "Strategic Highway ITS Plan."

Environment

The candidate measures proposed by the SCOPM Environment Task Force include greenhouse gas emissions, climate change adaptation cost, and storm water runoff best practices. Peer exchange participants suggested that some measure of energy consumption be added to the list. They also discussed:

- A desire to keep environmental performance measures simple;
- The potential to focus on a performance-based environmental management process rather then specific performance targets;
- Difficulties in contributing green house gases to the appropriate source (e.g., vehicles or fixed industry); and
- A preference for sustainability measures that highlight the positive impacts. The Leadership in Energy and Environmental Design (LEED) program adopted by the U.S. Green Building Council was cited as an example of allocating credit for incorporating certain environmentally sustainable elements into a project.

Freight/Economics

The peer exchange participants discussed significant challenges in this goal area related to multimodal and multi-owner considerations. Similar to other goal areas, they noted the importance of benefit/cost analysis for improving national freight and economics performance.

The participants then commented on several of the candidate measures under consideration. For example, some felt that the measure related to heavy train track capacity would require an accurate system inventory that would be challenging to collect and maintain. Others suggested that border crossing time is more of a transportation security consideration than a transportation capacity issue, and may not be an appropriate freight performance measure. Finally, participants noted that while the goal area is labeled as "freight/economics" the candidate list of measures in Table 2.1 focus on freight, and suggested that the list be expanded to include other aspects of economic performance.

Summary of Lessons Learned from Pavements and Bridges

In summary, lessons learned from the discussions of pavement and bridge performance that can influence the discussion in other goal areas include:

- When it comes to performance measures, less is more;
- Clearly define the goals and objectives for any specific goal area before establishing performance measures and targets;
- Define which components of the highway system are in the national interest to identify where national targets may be appropriate;
- Understand data limitations and establish how/which data can be used to evaluate national performance;
- Allow for flexibility in how states implement measures;
- Explore further the role of benefit/cost analysis in improving national performance with limited resources; and
- Consider focusing on implementation of a performance-based strategy rather then achievement of specific targets as the basis for accountability.

3.5 IMPLICATIONS FOR PLANNING AND PROGRAMMING

The transportation planning and programming process is the critical mechanism for achieving desired system performance. In this way, performance measures and targets should be applied to make decisions and allocate resources at the programmatic level. The SCOPM Planning and Programming Task Force, with members of the Standing Committee on Planning, is working to define the key elements of performance-based planning and programming and begin to

understand where states need to improve to achieve progress toward desired outcomes across goal areas. The Task Force is addressing questions such as:

- What is the outcome of the process – a list of projects, some other type of strategy, something else?
- Should both short- and long-term needs be considered?
- Does the current long-range transportation planning process allow for performance-based planning? If not, what must be done differently?
- How should agencies evaluate and prioritize projects that impact multiple goal areas and how can/should/will tradeoffs be made between goal areas?
- Do agencies have the tools and flexibility needed to evaluate transportation plans and programs to understand the outcomes of packages of investment decisions?
- Since the planning and programming process is tied to budget constraints, what agency targets are appropriate when revenues are uncertain?

Answering these types of questions and developing the definition of performance-based planning and programming will require coordination with the other SCOPM task forces, as well as with Federal, state, and local agencies. To advance the discussion in this area, FHWA and AASHTO are sponsoring a performance-based planning and programming executive round table to coincide with the 2009 AASHTO Annual Meeting.

3.6 IMPLEMENTATION

Peer exchange participants noted that moving transportation investment decision-making towards a performance-driven, outcome-based system will require a dramatic culture shift among implementing agencies at all levels. They also discussed that finding common ground in the general frustration of existing practices could help in building support for this type of change. For example, a performance-based approach could allow agencies to refocus on the projects and programs that matter most and de-politicize some day-to-day investment decisions. That said, the peer exchange discussions recognized that elected officials are ultimately responsible for transportation investment decision-making. Performance measures can and should influence these decisions, but they are not the sole driver of decisions.

Participants discussed the following three key challenges to implementation:

1. **Tradeoff Analysis –** What tools and techniques are available to help decision-makers evaluate and prioritize relative priorities between goal areas? Once the overall transportation budget is fixed, increasing performance in one area often requires decreasing it in another.

2. **Consistency and Comparability –** The lack of consistency and comparability among the states is a major hurdle for allocation formulas that aim to distribute Federal funds based on national performance measures and targets.
3. **Data Management Systems –** Greater confidence in data quality and analytical capabilities is required before agencies will be comfortable being held accountable for achieving specific targets.

They also discussed the importance of establishing a realistic timeframe for incremental implementation. It was noted that even if the process is not perfect at the outset, it is important to start somewhere and pledge to refine and expand over time. For example, documenting asset management processes would enable agencies to illustrate that they are taking an objective approach to decision-making, and that investments are being used in a manner that will lead to improved system performance. Strategic Highway Safety Plans were also cited as a good example of a performance-based program that is working. The transition to performance management occurs when agencies start making decisions that are informed by their implication on system performance. Peer exchange participants felt that currently, it is possible for agencies to take greater strides in the more advanced areas of preservation and safety, and that lessons learned in these goal areas can be applied to the others.

4.0 Next Steps

Throughout the peer exchange, participants identified and discussed a number of unknowns, unresolved issues, and barriers related to the implementation of performance-based transportation programs. However, they also recognized the significant benefits of performance management and identified several practical ideas for moving forward. They also recommended that the findings from the peer exchange documented above be incorporated into the following ongoing efforts:

- Subsequent work by the SCOPM tasks forces on finalizing recommended measures and national goals;
- FHWA's research effort on Performance-Based Management of Federal-Aid Highway Programs; and
- Planning for the "Executive Roundtable for Performance-Based Planning and Programming," which occurred on October 23, 2009 as part of the AASHTO 2009 Annual Meeting.

Finally, the participants strongly recommended that an initial set of targeted, national performance measures be finalized as soon as possible. Once this step is complete, the discussions can shift fully to how the measures will be used within a performance management framework. In planning for subsequent exchanges on this topic, organizers should be aware of the natural tendency for the discussions to shift towards the difficulties and potentially significant institutional changes involved in implementing a national performance-based transportation program. Performance measures are the foundation for performance management. By focusing first on specific measures, agencies can begin to make real progress without waiting for all the issues regarding the use of the measures to be resolved.