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Technical Report Documentation Page

1. Report No. MRUTC 05-05	2. Government Accession No.	3. Recipient's Catalog No. CFDA 20.701	
4. Title and Subtitle Use of Functional Silos to Optimize Agency Decision Making		5. Report Date February 2008	
		6. Performing Organization Code	
7. Author(s) T. H. Maze, Omar G. Smadi, Neil Burke, and C. Ian MacGillivray		8. Performing Organization Report No. MRUTC 04-01	
9. Performing Organization Name and Address Center for Transportation Research and Education Iowa State University 2711 South Loop Drive, Suite 4700 Ames, IA 50010-8664		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. 0092-05-22	
12. Sponsoring Organization Name and Address Wisconsin Department of Transportation Hill Farms State Transportation Building 4802 Sheboygan Avenue Madison, WI 53707		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes Project completed for the Midwest Regional University Transportation Center with support from the Wisconsin Department of Transportation. Visit www.ctre.iastate.edu for color PDF files of this and other research reports.			
16. Abstract The purpose of the project was to document how agencies make positive use of functional silos and then efficiently allocate resources across them. Functional silos are considered to be any group of expertise within a transportation organization that focuses on one area of expertise. Often, different functional silos compete for agency resources. Functional silos impact their agency positively by allowing members to accumulate expertise in the area of the silo. On the other hand, silos can have a negative impact on resource allocation. The solution to efficient resource allocation is bridging the silos and making overall decisions that offer the most satisfactory solutions globally.			
17. Key Words asset management — Florida DOT — functional silos — MARC case study — Maryland DOT — Ohio DOT — resource allocation		18. Distribution Statement No restrictions. This report is available through the Transportation Research Information Services of the National Transportation Library.	
19. Security Classification (of this report) Unclassified	20. Security Classification (of this page) Unclassified	21. No. of Pages 101	22. Price NA

USE OF FUNCTIONAL SILOS TO OPTIMIZE AGENCY DECISION MAKING

**Final Report
February 2008**

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ACKNOWLEDGMENTS

The authors would like to thank the Midwest Regional University Transportation Center at the University of Wisconsin Madison and the Asset Management Pooled Fund Study for providing funding for this project. We would also like to thank the members of the pooled advisory committee, committee chairman, Leonard Evans of Ohio Department of Transportation, and members Richard Lilly of the Michigan Department of Transportation and Michael Shea of the Missouri Department of Transportation. We would also like to particularly thank the individuals that hosted our case studies at the three STAs, the Ohio Department of Transportation, the Maryland State Highway Administration, and the Florida Department of Transportation, Mr. Leonard Evan, Mr. Jeff Smith, and Ms. Christie Holland, respectively. We would also like to thank Sabrina Shields-Cook at Iowa State University for improving the readability, format, and content of this report.

EXECUTIVE SUMMARY

This report was funded by the Asset Management Pool Fund Study and managed through the Midwest Regional University Transportation Center at the University of Wisconsin-Madison. The research was conducted by the Center for Transportation Research Education and Research at Iowa State University. The purpose of the project was to document how agencies make positive use of functional silos and then efficiently allocate resources across them. Functional silos are considered to be any group of experts within a transportation organization that focuses on one area of expertise. For example, with a State Transportation Agency (STA), Maintenance, Bridge, and Pavement Offices may compete for resources. Each office maintains expertise in the functional area and reinforces expertise through experience. Silos may also be geographical, where districts or regions within an STA compete for project- or program-level resources. Familiarity with the region promotes efficiency in delivery services and experience tends to reinforce familiarity.

It is important for STAs to maintain functional silos to retain and improve competency in each of their core business areas. On the other hand, silos can have a negative impact on resource allocation. For instance, resource requirements may be met in one silo, while resources for another silo are sacrificed. The solution to efficient resource allocation is bridging the silos and making overall decisions that offer the most satisfactory solutions globally.

Some transportation agencies tend to do a better job than others at making cross-silo comparisons. We attempted to conduct observational research focused on the factors that help agencies bridge silos and to document good practice. We also identified issues that preclude agencies from making better financial resource allocation decisions. In general, the state of the practice of cross-functional areas is to establish goals and the resulting objectives that encompass the services the agency offers. The next step is to develop performance measures and performance standards that support the goals and objectives. However, it is important that goals are clear and unambiguous, and of paramount importance that the goals are comprehensive. For example, an effectively managed STA cannot focus on efficient project delivery without setting goal(s) that deal with safety; similarly, agencies that focus on traffic safety or congestion must also have goal(s) for infrastructure preservation. The state of the art has not yet gone beyond performance measurement to the next level where all benefits can be monetized and investments can be made to maximize total benefits, although at least one STA has made great progress in using economic models rather than allocating to meet performance measures or performance standards.*(i)* Given the current state of the art, we focus on allocation based on performance standards. Most performance measures are abstract engineering measures, such as bridge health index, traffic delay due to congestion, etc. Because they are not measured in the same units, they are difficult to compare, requiring experienced managers to make comparisons across asset categories. In the recommendation section, we suggest that the state of the art move to economic models at some time in the future.

This research is largely based on case studies and interviews, not on empirical data. The interviews led researchers to make conclusions about practices regarding the bridging of silos.

Project Summary

The project was conducted in three major steps. Each step was designed to provide many perspectives on bridging silos and to help identify specific agencies with particularly good practices. The first step was to work with the project advisory committee to select states known for having good practices and to conduct detailed telephone interviews with financial managers from state transportation agencies (16 states were ultimately selected). These states were specifically chosen to include diversity in size, diversity in the relative proportion of the state that was urbanized or rural, and geographical location within the U.S. Typically, the survey was conducted with individuals having agency-wide responsibility for asset management. At some STAs, the interview participants were from asset management offices; others were planning directors that lead asset management, and still other interview participants were top financial managers at their STAs. These participants were interviewed to understand resource allocation processes. Although the interviews contained many useful insights, two issues that the researchers felt were most revealing were that 1) although all states developed physical infrastructure and operations that were relatively consistent and conformed to national guidance, financial management varied largely and was unique to each state; and 2) management of resources was often heavily influenced by the sources of financial resources. For example, largely rural states tended to have a large proportion of their budgets funded through federal sources, which offered less discretion in allocation of resources. Other states with relatively flexible bonding policies faced considerably different programming issues than states that followed a financially conservative, pay-as-you-go funding policy.

The second step was to conduct detailed case studies of three STAs. The researchers used the Missouri Department of Transportation (DOT) to develop and test case study strategies. While the Missouri DOT investigations were very useful to further refine the case study methodology, findings from Missouri DOT are not reported here. The project advisory committee selected the STAs in Ohio, Florida, and Maryland for complete case studies. Each of these case studies provides good examples of how the individual agencies bridged silos, but the examples also need to be taken in the context of each agency being examined.

Through these three cases studies, four similarities were found that helped the STAs to bridge silos. These included 1) a reliance on performance measures to help drive efficient allocation of resources, 2) top-down policy and programming guidance but decentralized execution of programs through district or regional offices, 3) long-term professional leadership that crossed over the terms of governors, and 4) a surprising lack of emphasis on having the most sophisticated asset management—although good information is critical to good management decision making, good decision making was not necessarily tied to having the most sophisticated asset management tools. We also found through the case studies that agency goals and objectives must cover the performance of all services provided. In other words, goals and objectives must be thorough and balanced.

The third step was to hold a workshop on asset management in conjunction with a national American Association of State Highway Officials (AASHTO) meeting. Most of the attendees of the meeting were top managers from STAs across the country. Although the researchers started the session with a structured set of questions, the meeting very quickly moved to more extemporaneous discussion of asset management and the setting of priorities for asset expenditures. Although several conclusions were reached, probably the most surprising was the concern expressed by top managers regarding the sustainability of the highway systems in their states. Several managers felt that in the near future many states may be in a financial squeeze even to the point where they might have trouble matching federal funding. One particular issue with which state managers desired help was to make tolling requirements more flexible to allow for the tolling of capacity improvements or maintenance of existing facilities.

Other issues highlighted by the meeting attendees were that federal funding category requirements (e.g., 3R/4R, enhancements, bridge programs, enhancement requirements) were burdens for the states but not insurmountable burdens. Members of the workshop felt that federal data requirements needed to be reviewed in light of current decision making. Some data requirements were felt to be legacies of past needs. Attendees also felt that asset management systems need to evolve from an investigation of one infrastructure element or become an autonomous asset within a corridor-wide or system-wide management of systems where all asset conditions, operations, safety, and improvements are all considered together, along with system impacts.

Overall conclusions

AASHTO, FHWA, and other organizations have created guidance to standardize transportation infrastructure and operations across the country. For example, one successful program is the Manual on Uniform Traffic Control Devices (MUTCD), which was developed to allow drivers to travel from one coast to another with one set of operational rules and one set of driver expectations.

Finance, financial management, and system performance are unique to each state. Furthermore, it is expected that each state will have unique transportation needs and face unique circumstances regarding its ability to finance transportation systems. However, as transportation infrastructure is built to similar standards from one jurisdiction to the next, more uniformity is expected in how the performance of these facilities is measured and how they are financed. AASHTO, the Transportation Research Board (TRB), and FHWA are other organizations that should take leadership in providing uniform guidance.

CHAPTER ONE: INTRODUCTION

The purpose of this project was to examine how State Transportation Agencies (STAs) are able to bridge across functional silos to reach a desirable allocation of resources. Some silos focus on activities (e.g., planning or design) or on categories of assets (e.g., bridges or pavements) and some focus on geographical regions (e.g., districts or regions). However, all silos are generally promulgated for good reasons. They allow the members working within the silo to grow their expertise through focusing their work. Silos are not only helpful for building expertise in a specific area, but they also build advocacy and historical memory for work being done in the silo.

While useful, silos tend to breed misallocation of resources through sub-optimization of resource allocation between silos. For example, the bridge maintenance office may have the objective of fulfilling all needs on the STA's bridge system, but at the same time there still may be some unmet needs on the pavement system. Although goals are met in one silo (the bridge system), unfunded needs remain in other parts of the system, resulting in an agency-wide sub-optimal allocation of resources. To reach an optimal allocation of resources, individual silos must be bridged, and trade-offs must be made across silos to attempt to reach a global optimum. Best current practice for bridging silos is the use of performance indicators to balance resources between silos. However, it is our opinion that dissimilar performance measures for each silo (e.g., total fatalities and injuries for safety and roughness for pavements) must eventually be bridged by economic analysis, where benefits for improvement in each silo are monetized and benefits are measured economically instead of through indicators. However, the state-of-the-art performance measurement is only now forming and it will be some time until economic evaluation is widely used.

Research

The best that could be done to evaluate the practice of bridging silos was to take a snapshot of current practice, since circumstances may change. People have taken new jobs, systems have been improved, and financial conditions have changed.

To understand the state of the practice, we conducted our research in three steps. The first step was to identify states that were believed to have good practices. These were identified with the help of the advisory committee. A fixed set of questions for the interviews were developed and sent to identified interviewees at each STA. This list of questions was sometimes rigorously followed, and in other cases the discussion was more extemporaneous. A summary of the responses is discussed in chapter 2, and the project web page includes a transcription of individual STA interviews (<http://www.ctre.iastate.edu/research/silos/index.htm>). The summary discussion is more useful and should be sufficient.

In most cases, our interview was at a very high level and did not delve into the mechanics of asset management systems, but rather the mechanics of bridging silos. For example, when we were told that an STA had a pavement management system, we did not ask about the software or

the pavement condition measurement technique or even if the system operated at the project or network level. Instead, we tried to keep the discussion above the individual silos.

The next steps were taken simultaneously. One was to conduct in-depth case studies of asset management processes at STAs that seemed to bridge silos when allocating resources. Again, the focus remained on bridging silos rather than how each silo is managed internally. In many cases, we found that the management systems used were not the most advanced systems, and discussing each would require more effort than what the project scope entailed. The selection of case study agencies was based on recommendations from the advisory committee, individual phone interviews, and recommendations by the researchers. The Missouri Department of Transportation offered to be the trial organization and help us to polish our case study framework. Much of what was learned from the Missouri Department of Transportation helped to guide other interviews. After visiting Missouri, researchers interviewed the STAs in Ohio, Maryland, and Florida. Interviews were conducted by identifying a lead individual and then sending them a list of questions. Interviews and a conclusion for the Ohio, Maryland, and Florida case studies are included in chapter 2.

To understand the problems of bridging silos experienced by local and regional governments, we interviewed a large urban area Council of Governments/MPO and found that silos were not a significant issue for local and regional governments. Due to their multimodal and multidisciplinary nature, silos were much less of an issue.

To further explore the bridging of silos, we invited several top officials from various STAs to attend a brief workshop. The purpose of the workshop was to obtain extemporaneous comments on the difficulty of bridging silos. Again, the focus of the meeting was at a very high level and did not focus on management systems within silos. Many STA representatives felt that system performance measures to compare investment across silos were a sufficient approach. Many of the top executives were more concerned about finance than sub-optimization of resource allocation. Many STAs are facing budgets that may only allow the agencies to focus on preservation, with little or no resources for system enhancements or new projects.

CHAPTER 2: STATE TRANSPORTATION AGENCIES FUNCTIONAL SILO RESOURCE ALLOCATION TELEPHONE INTERVIEWS

Functionally focused units (silos) are groups of expertise within the STA. For example, the Office of Bridge Development, the Office of Maintenance, the Office of Traffic Engineers, or their equivalents within an STA are functional areas that focus on steps in project delivery or on system operations and maintenance. Functional focus has an advantage because it allows members of the functional area to focus on their area and to develop deep levels of expertise in the area of focus.

Historically, resources have been allocated to specific functions without making trade-offs between functions. Asset management principles are moving agencies to make holistic choices across functional silos. For example, STAs had difficulty in making explicit trade-offs between such far-flung activities as winter snow and ice operation and pavement maintenance, or between bridge rehabilitation and capacity expansion. Our study, including the telephone interview, focused on determining the methods used by those STAs that do a good job of making holistic trade-offs.

We interviewed a number of STAs to determine, from a very high level, how each agency allocates resources. Although each state tends to be unique, they do have some characteristics in common. The most common problem for resource allocation was the lack of discretionary resources. All areas of the activities for these STAs seem under-funded, causing little latitude in moving funding from one functional area to another. The researchers initially thought that federal or even state restrictions regarding the spending on specific functions of funds (categories funding) would cause major problems for STAs wanting to allocate resources where they could be more efficiently used. However, even the STAs with the smallest state budgets (as a portion of all funding) were able to spend all of their category funding and use state moneys to fund other activities within their state program. Some agencies even felt that category funding was valuable because it might force the agency to develop a good program that might otherwise be left unfunded through state sources. Overall, we saw no dramatic shifts in resources between silos as a result of asset management systems. Even in states that boasted of significant flexibility, we observed only marginal shifts. All states have funded their core business before and continue to do so.

We surveyed sixteen STAs to obtain information from all agencies from a very high level. Interviews were conducted by telephone and involved a predetermined set of questions (see appendix A). These questions were sent to the interviewee at least one week in advance, and then a telephone survey was conducted by at least two, and usually three, of the researchers. The exact questions in the interview were seldom the same. Although each interviewee was asked all of the questions in the questionnaire, many discussions extemporaneously moved to questions of interest to the interviewee or to the researchers. Often these questions were only meaningful in the context of the agency interviewed. Below is a summary of what we found across all sixteen interviews. Each individual interview is available through the project web site. Once the write-ups were completed, they were returned to the individual interviewee for comment and correction.

Methodology

Sixteen STAs were selected for interviews based on the advisory committee’s perception of which states would provide the most beneficial information regarding their resource allocation process and ability to bridge functional silos. While selecting the STAs to be interviewed, we attempted to stratify the interviewees equally by agency size and population within the state, with the intent to geographically distribute interviews around the country. We sought out methods used by STAs to deal with the countervailing forces of functionally focused units and to merge them in order to apply holistic asset management principles. Figure 1 depicts the STAs that were interviewed.

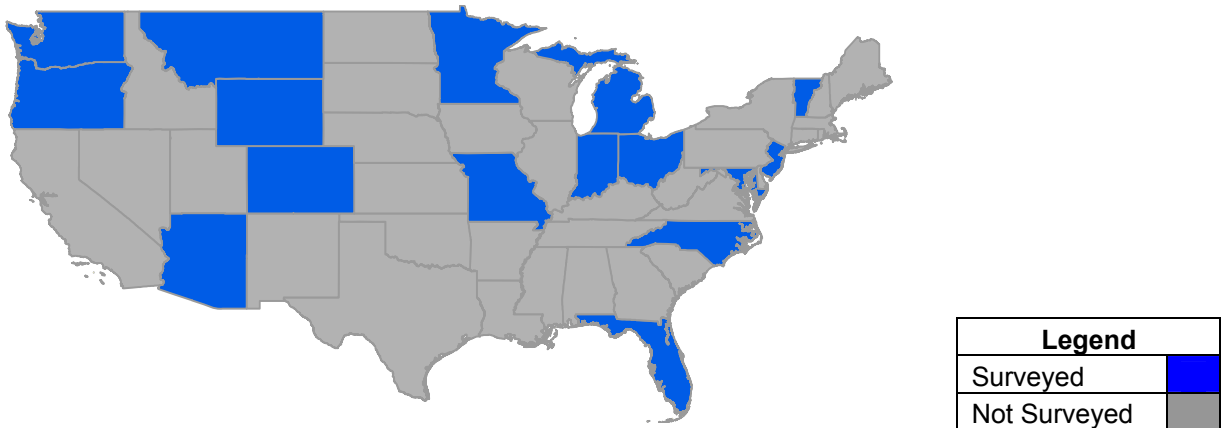


Figure 1. Surveyed STAs

The survey outline served to address the organizational structure, revenue distribution, coordination of asset management systems, and cross-asset decision making for each STA. The responses displayed in this research report are not state-specific and serve to assess the overall state of the practice, although the reader may review the summaries of individual interviews posted on the project web site to understand issues faced by an individual state.

Survey Responses by State Transportation Agencies

1.1 Would you describe your organization’s resource allocation process as centralized or decentralized, and why?

Of the sixteen states interviewed, five STAs described their resource allocation process as decentralized; six had both centralized and decentralized elements to their resources allocation process; and the other five characterized their resource allocation process as centralized (see Table 1). Smaller states (in size or population) tended to have a centralized resource allocation process.

Centralization can benefit a small-sized (geographically small) state because the programming for preservation and project development can occur in one office and be delegated throughout the state. Similarly, a large state with a relatively small population benefits from a centralized resource allocation process because resource allocation and project planning can be conducted at the central office and delegated to the sparsely populated regions.

However, centralized STAs are not always small in size or population. Several STAs identified their resource allocation process as centralized because the state and federal revenue stream is allocated through the central office.

Most of the STAs that were identified as having a decentralized resource allocation process were states with large population centers that must maintain extensive transportation assets. A decentralized resource allocation structure enables a district to have more authority in project selection and prioritization activities within a given jurisdiction. However, capital projects, major preservation projects, and the Statewide Transportation Improvement Plan (STIP) are organized and implemented through the central office for many decentralized STAs.

Table 1. Comparison of assets managed to state population and agency organizational structure

Highway System, Bridges Maintained, Population, and Agency Organizational Structure by State					
	<i>Number of interstate highway miles maintained</i>	<i>Number of non-interstate highway miles maintained</i>	<i>Number of bridges maintained</i>	<i>Population</i>	<i>Agency organizational structure</i>
Arizona	1,677	5,139	1,783	5,130,632	mixed
Colorado	970	8,100	3,733	4,301,261	centralized
Florida	1,471	40,829	6,377	15,982,378	decentralized
Indiana	1,171	11,300	5,617	6,080,485	mixed
Maryland	481	5,133	4,975	5,296,486	centralized
Michigan	1,394	8,326	4,357	9,938,444	decentralized
Minnesota	912	11,933	4,954	4,919,479	mixed
Missouri	1,178	32,407	10,285	5,595,211	decentralized
Montana	1,196	10,819	5,294	902,195	centralized
New Jersey	420	10,232	2,911	8,414,350	centralized
North Carolina	1,019	26,825	20,873	8,049,313	mixed
Ohio	1,572	19,289	11,564	11,353,140	decentralized
Oregon	730	8,067	7,400	3,421,399	decentralized
Vermont	320	2,704	2,659	608,827	centralized
Washington	764	7,000	3,000	5,894,121	centralized
Wyoming	914	2,220	3,113	493,782	centralized

1.2 *Is your agency governed through a commission or a legislative committee, a strong CAO, or another form of leadership? If led by a commission or a legislative committee, then what resource allocation authority does the commission have?*

STAs reported a wide array of leadership structures in this research project. The following categories of governance were found in the survey process:

- *Transportation Commission*: Six STAs indicated that they were governed by a transportation commission. Four of these six commissions were appointed by the governor and approved by the legislature. The other two were comprised of a bipartisan representation with a majority reflecting the governor's political affiliation. The transportation commissions were responsible for enacting policy, prioritizing projects, and approving the STIP. Generally, these STAs were representing mid-sized states with intermediate-size populations.
- *Transportation Secretary*: Four STAs were governed by a transportation secretary who sat on the state's cabinet and reported directly to the governor. Three of these were compact states.
- *Director*: Three of the sixteen STAs were governed by a director. In each case, the governor of the respective state appointed the director. These states tended to have larger populations and significant transportation assets.
- *Strong Chief Executive*: Two STAs were governed by a strong chief executive. In this case the transportation legislative committees provided oversight to the executive. These STAs represented states with intermediate populations and mixed-agency organizational structures.

1.3 *Does your agency own or dedicate funding to transit facilities?*

Twelve of the sixteen STAs that participated in the survey were primarily "highway departments" and did not directly fund transit. These STAs administered transit funds to local municipalities.

The remaining four STAs funded transit operations on an annual basis, and were allocated by the following methods for the respective states:

- Funding levels determined by state statute
- A fixed portion of the gas tax
- A predetermined portion of vehicle registration taxes
- Specifically earmarked funding for transit by the state legislature

The majority of transit funding was through federal subsidies, while some states had a fixed amount of funding that is allocated by the state legislature.

1.4 Does your agency own or dedicate funding to railroad facilities?

Nine of the sixteen STAs either owned or provided funding to railroad facilities. Four STAs owned railroad facilities and leased the track to the operator. One STA in a small state owned over half of the rail facilities within the state and leased them to operators. Five STAs provided financial assistance to the rail facilities in the state, according to the following:

- Funding levels determined by state statute
- Appropriations for freight property management, rail preservation, and freight preservation
- State funding dedicated to railroad infrastructure improvements
- Subsidies provided to short lines to fund maintenance and repairs

Seven STAs did not fund railroad facilities. These STAs' funding streams for other modes of transportation were derived from the states' general funds or other state agencies.

1.5 Does your agency own or dedicate funding to ocean and inland port facilities?

While none of the STAs that participated in the survey owned ports, three STAs allocated funding to port facilities. One STA allocated fifty percent of annual transit funding to a port authority for public transportation purposes. Two STAs have allocated funding to port authorities using state funds.

1.6 Does your agency own or dedicate funding airport facilities?

Four of the sixteen STAs surveyed owned and operated airport facilities. All STAs funded airports by allocation of funds from their respective state's aviation fuel tax. While the remaining eight STAs did not own airports, they allocated federal funding to subsidize airports in their states.

1.7 Does your agency own or dedicate funding to other facilities?

Two of the sixteen STAs operated and maintained extensive ferry systems in their states. Both STAs used funding from their states' highway funds to facilitate operations and maintenance on the ferry system. An STA in a sparsely populated state operated an extensive communication system, which was being integrated with the other management systems being operated by the agency.

1.8 Does your agency bond for capital projects, or does your agency follow a pay-as-you go philosophy? If a pay-as-you go, is this set by policy or by statute?

Thirteen states used agency bonds to fund capital projects. Nine of the thirteen states had bonding authority, with the state legislature or transportation commission approving the amount of bonding. One STA had to confirm the authorization to bond through a public referendum. Another STA had to apply for bonding for highway projects through a statewide transportation trust fund authority. The two remaining STAs were using Garvey bonds for capital projects. A compact state with a large urban population was using bonds to maintain a constant cash flow.

All of the STAs that used agency bonds for specific capital projects derived the funding to repay the bonds from the state gas tax. Several of the STAs financed bonds through the state transportation fund and general revenue from the state legislature for general system enhancement.

Three of the sixteen STAs were classified as being primarily “pay-as-you-go” states. While each STA has discussed the possibility of using agency bonds in future years, the “pay-as-you-go” philosophy was the method used to fund capital projects. Two of the three STAs that adopted the “pay-as-you-go” philosophy were states with a small overall population that did not have many large capital projects to complete. The third STA sold all of the bonds that it had authorization to sell ten years ago and has been operating in a “pay-as-you-go” mode ever since.

1.9 What are the sources of state funding, and are these funds dedicated to transportation? Are they dedicated legislatively or constitutionally?

All sixteen STAs identified the state gas tax as the primary source of revenue for highway projects. Four of the sixteen STAs had highway trust funds that allocate funding to highway projects through revenue from the state gas tax and license and registration taxes. Other secondary funding sources of revenue identified by the STAs include the following:

- Automotive parts tax
- Drivers license fee (two STAs)
- Heavy vehicle weight tax (four STAs)
- Truck weight tax
- Rental car surcharge
- State sales tax (three STAs)
- State vehicle sales tax (two STAs)
- Title fees (three STAs)
- Vehicle registration tax (eight STAs)

1.10. What is the financial climate of the state, and have there been any successful efforts to divert transportation funding to other uses?

Three of the sixteen STAs indicated that they were primarily preserving what they have, rather than looking for new capital projects because preservation was all they could afford, given available funding. Every STA indicated that transportation funding has been diverted to fund other programs in different departments throughout the state government. In general, most of the funding diversions were used to subsidize the State Patrol and Department of Motor Vehicles, to fund transit, or to be reallocated to the state's general fund to service debt incurred from bonding for capital projects.

1.11 How would you describe the balance between state funding and federal funding provided to your agency?

For eight of the sixteen STAs, the majority of the funding sources were derived from state funding. Generally, the STAs with a funding balance originating from a majority of state funding had large population centers with significant transportation infrastructure. Six STAs indicated that the majority of their respective state's funding was derived from federal aid. The STAs that derived a majority of their funding streams from federal sources tended to be rural states with fewer significant transportation needs than the STAs with a majority of state funding. Two STAs described their funding streams as equal amounts of federal and state funding.

Two STAs with independent toll facilities participated in a "soft match" program, in which federal funds were matched by toll authority funds. These funds could be used similar to state funds.

1.12 Does your agency have authority to toll finance transportation projects? If so, are there restrictions on the use of toll revenues?

Four of the sixteen STAs had toll authorities. These STAs were to spend the revenue generated from tolls on repairs and maintenance of the tolled facility. One STA allowed funding to be spent on state roads within a ten-mile radius of the toll road facility.

Overall, eight of the sixteen STAs had operating toll facilities within their states. The toll facilities in six of the eight STAs operated independently of the STA. Two STAs with significant population centers had implemented or were considering the implementation of a peak period and a high occupancy tolling lane on freeways that were prone to congestion.

Two of the sixteen STAs indicated that state toll authorities had been established to analyze proposed toll facilities. The toll authorities could only consider the tolling of newly constructed facilities.

1.13 Are there additional sources of revenue?

Six of the sixteen STAs received additional funding from sources other than state or federal funds. The following funding sources have been allocated to STAs:

- Regional sales tax to maintain local roads and build freeways
- Funding appropriated by the legislature from the general fund
- Additional funding provided by private developers to construct facilities such as intersections and interchanges
- Billboard permits
- Lottery bonds
- Mineral royalties and severance taxes

1.14 Of the funds that are routinely received from the state dedicated to certain functions such as funding for bridges, funding for pavement preservation, funding to support economic development, funding to support system expansion, funding devoted to large projects, funding for the interstate system versus primary highways, etc., what entity identifies the amount of funds dedicated to each function (e.g. statute, legislature, commission, policy, or other), and what criteria are used to set resource levels devoted to each function (e.g., needs, number of jobs created)?

Three of the sixteen STAs had funding levels dedicated to each function (bridges, pavement management, and economic development) determined by the state legislature. Ten STAs received funding that was not tied to any specific program but was to be spent on the highway system and could be used to fund any highway program. These STAs allocated preservation funding based on the output from the pavement and bridge asset management systems. Other funding allocation methodologies included the following:

- A transportation commission determined the allocation of funding among various programs.
- The STA allocated funding based on policy and statutory formula.
- One STA had 24 funding categories that accounted for various department programs. Funding was allocated to each funding category based on historical allocations and demonstrated needs. The STA administrator would decide on the final distribution of funds.

Only some of the STAs that participated in the interview process received funding from the state legislature that can be used for a set purpose. Most STAs received their highway funding in a single-state appropriation. The agencies used bridge and pavement management systems or another system which ensured that the funds were being allocated in an equitable manner.

1.15 For the funds routinely received from state sources, are there distribution requirements based on geography or population (e.g., split between urban and rural, split between quadrants of the state, allocated to regions in proportion to population or in proportion to revenue generated); and, if so, is the allocation based on statute, determined by the legislature,

determined by a commission, based on agency policy, etc.?

Seven of the sixteen STAs allocated preservation funding based on the outputs from the asset management systems. The remaining nine STAs allocated preservation funding based on historical trends. Two of these STAs were currently transitioning to a performance-based plan.

In regards to capital project programming, two STAs allocated funding to regions based on a 50/50 urban/rural split. These STAs had one or more large metropolitan areas with significant highway projects. Two STAs indicated that funding was allocated to each region based on the amount of lane mileage and vehicle miles traveled. Four of the sixteen STAs allocated funding to each district based on population distribution and lane mileage in each district. A densely populated STA allocated funding for capital projects to each region based on a 50/50 population and gas tax collection split. A mid-sized state with a significant metropolitan area allocated funding for capital projects based the long-range planning process of its STA. A large state with a majority rural population allocated funding for the primary system based on a performance metric instead of a geographic split to each region. Three STAs in geographically-small states allocated all funding to regional governments with oversight by district managers. One STA collaborated with the MPOs throughout the state to develop capital projects on the system. One STA did not have a distribution based on geography; instead, the regional planning commissions within the state worked with the STA to develop a prioritized list of projects for each region. This state was considered entirely urbanized.

1.16 Does the legislature or the administration ever provide special purpose funding (one-time funding) for special projects or special programs? If so, are the projects funded adequately to complete the project or program? If not, how is the under-funding of state-level special initiatives handled?

Seven of the sixteen STAs indicated that the state legislature did get involved in some capacity with the process of programming projects. The state legislatures of STAs with significant metropolitan areas merely recommended specific projects or provided additional funding, while the state legislatures in rural states tended to have greater influence on the STA project selection and programming process. Two STAs had an overabundance of projects to complete with limited funding, so these agencies often petitioned the state legislature for additional funding.

1.17 Does your agency operate an overall asset management system (a master asset management system)? If so, could you briefly describe this system? How is this system used in actual resource allocation?

None of the sixteen STAs surveyed operated a master asset management system. Four STAs indicated that their agency has integrated several asset management systems to reach a global optimum. Data were centrally stored, providing each office the ability to access the data for decision-making purposes. The current asset management systems were limited to measuring current performance for each asset against performance metrics, which were set for each asset.

Two of the STAs had well-integrated bridge and pavement asset management systems that were used to make tradeoffs between various transportation investment scenarios. Two STAs used their bridge and pavement management systems to integrate the outputs into the statewide performance-based plan. Five STAs were in the process of developing linkages between asset management systems, but their existing asset management systems were undeveloped, and tradeoffs did not exist between physical assets, safety, or congestion. Three STAs did not have plans to implement an overarching asset management system. An STA in a sparsely-populated state indicated that the agency preferred the labor-intensive process of un-integrated asset management systems because it facilitated cooperation between departments, making the employees more aware of the processes that each asset management system completed.

2.1 Does your agency operate systems that manage individual categories of assets: (i.e., a pavement management system, bridge management system, maintenance management, safety management)? If so, is there any effort made to bridge resource allocation among these systems and how?

All of the sixteen STAs used pavement and bridge management systems that were operated out of the central office. Seven STAs used bridge management systems that were developed around commercially available software such as PONTIS. Four STAs were using bridge management systems that had been developed internally by the agency. Six STAs indicated that there was some level of integration between the asset management systems for the purpose of making tradeoffs.

2.2 Does your agency use such economic decision-making tools as Life Cycle Cost Analysis, Benefit–Costs analysis, HERS-ST, etc., and if so, how?

Seven of the sixteen STAs used a life cycle cost-economic decision making tool. Four STAs used a life cycle cost analysis for project prioritization purposes. Three STAs used a life cycle cost analysis for pavement type determination analysis. Five STAs used a benefit–cost analysis for capital project selection. Two STAs used a “worst first” project prioritization scheme for their pavement preservation programs. Two STAs were using the Highway Economic Requirements Software-State Edition (HERS-ST) in the regional planning process to analyze congestion and select capital projects. One STA did not use any economic processes to select projects.

2.3 What is the role of functional units in general terms in asset management and resource allocation process? Is the process documented? Are the outcomes formally reported?

Five of the sixteen STAs identified the functional unit’s adherence to designated performance targets for individual assets as an effective method of resource allocation management. In all cases, the functional units were to report the results of the performance targets to the central office.

2.4 *Is the same process used for both state and federal funds?*

Eleven of the sixteen STAs used the same process for programming state and federal funds. These STAs did not use a particular funding source to fund specific projects. An STA in a largely rural state, which received most of its funding from federal aid, had a \$10 million discretionary state program that was used primarily for system preservation. This agency also received preservation funding from state sources.

3.1 *How do the state sub-areas decide what their financial needs are?*

Twelve of the sixteen STAs indicated that the districts have used the outputs from the pavement and bridge management systems to determine needs in the sub-areas. One STA used the output from its pavement management system but did not rely on the output of a bridge management system to determine need. Instead, bridge projects were prioritized based on their structural condition within each sub-area. Bridge engineers would analyze the impact of freight and the overall safety level of each bridge to determine the treatment necessary for a deficient structure. The three remaining STAs determined need based on the following processes:

- A maintenance management system allocates funding to sub-areas based on the distribution of assets relative to other districts. For example, the maintenance management system will calculate acreage of land to be mowed and the lane mileage to determine the amount of funding for each district.
- For each fiscal year of the transportation work program, all districts develop a priority list of projects by soliciting community opinions through a community involvement process. Cost estimates and scheduling are identified and reviewed by the district.
- Each district creates separate three- and ten-year transportation improvement programs (TIP), which are then rolled into a statewide TIP.

3.2 *How is resource allocation conducted between state sub-areas?*

In four of the sixteen STAs, resource allocation between state sub-areas was determined based on a statutory formula. Two STAs based their formulas on need (expressed through pavement and bridge management systems) and historical allocations. Another STA distributed funding between state sub-areas based on lane mileage and population and did not consider need.

A comprehensive performance measurement process was used by two STAs to determine resource allocation between state sub-areas. The STAs set performance targets for specific assets. Asset management systems determined the current and projected condition of the particular asset. One STA had a project steering committee that made recommendations to department leadership based on regional targets (resource allocation between state sub-areas), condition forecasting (progress towards goals), needs analysis, and geographic equity.

3.3 How do state sub-areas coordinate between themselves and with the central office and other functional offices (pavements, bridges, safety, design, etc.)?

In seven of the sixteen STAs, pavement and bridge management systems were operated on a statewide basis from the STA central office. Deficiencies were determined and the information given to each district, with the district engineers prioritizing preservation projects within their sub-areas. Design and safety issues were determined in a decentralized manner, with the district engineers determining deficiencies within their sub-areas. Projects were programmed into the STIP after committee approval.

Two of the STAs had their respective state sub-areas coordinate with the central office and other functional offices through the programming of projects for the STIP. Another STA attempted to coordinate roadway improvements from other offices when a highway segment is being improved. A smaller, urbanized STA conducted all resource allocation activities from the central office on a statewide basis. Metropolitan Planning Organizations (MPOs) from each region assist the central office in the resource allocation process.

Two STAs indicated that barriers exist within the agency, which prevented effective coordination between state sub-areas and the central office. Lack of communication and uniform data collection procedures prevented state sub-areas from coordinating with other functional offices in these STAs.

3.4 How are resource allocation plans coordinated with regional governmental agencies (e.g., MPOs and rural regional planning organizations)?

Three of the sixteen STAs with significant urban centers collaborated with MPOs in the project selection process. Three other STAs collaborated with MPOs to obtain an understanding of the needs within each urban area. One of these STAs has formed a statewide asset management committee where cities and county governments meet with the STA to determine needs as well as to facilitate data integration and sharing of data between agencies.

In an entirely urbanized state, the MPOs in each jurisdiction were solely responsible for identifying the needs and reporting them to the STA. The STA subsequently programs the project into its STIP. The agency and the MPOs assembled a project pool document that provides the list of potential projects for the upcoming fiscal year.

A rural state with a significant urban center had its metro government conduct project selection, development, and funding independently of the STA. The metro government developed projects by using state and federal funds, and the MPO had the authority to veto projects that have been programmed by the STA.

Three STAs in rural states indicated that coordination with MPOs was limited to monthly or annual meetings, where funding for projects within the jurisdiction is negotiated.

4.1 Is there a formal process for the state executive, a legislative committee (or legislators),

or an external oversight committee to review agency resource allocation and projects/programs and make resource allocation recommendations?

Eleven of the sixteen STAs had a formal process for reviewing agency resource allocation decisions. Two STAs had transportation legislative committees that reviewed the transportation budget and approve projects. Two other STAs had appointed transportation committees in the senate and the house that must review the budget. One of these STAs had its house and senate transportation committees work through the biennial budget to approve and modify projects. The legislature has the opportunity to review each project if it so desires. The other STA had appointed budgetary committees from each house in the legislature to review and approve the annual budget for the STA.

The state legislature implemented a managerial accountability program for one STA, where the program managers must adhere to specific goals, and have their highway segments and bridges meet performance measures. This STA also formed a committee that will analyze capital improvement projects over \$5 million.

Two STAs had statewide project screening committees to analyze potential projects and determine if they meet the performance goals and budgetary needs of the sub-area. The screening committees could make suggestions on potential projects to the transportation commission or the state legislature, but these entities could not select or program specific projects. A mid-sized state appointed its governor to review the allocation of funding for projects and programs for the STA. In addition, the governor had the authority to make tradeoffs and allocate portions of STA funding to other government agencies.

4.2 Is there an informal process where the state executive or legislators review agency resource allocation and projects/programs and makes resource allocation recommendations?

Two of the sixteen STAs indicated that there is an informal process in which state legislators or executives review projects and programs and make recommendations. One STA identified its project programming process as an opportunity for review of the projects and programs. Many of the project selection decisions were guided by input received throughout the planning process and made in consultation with local governmental agencies, a rural task force, MPOs, and legislative partners.

Another STA held meetings with the joint legislative committee to identify the funding needs of the STA, with the committee making educated decisions on the resource allocation needs of the department.

4.3 If there is external oversight, how are adjustments made? Can you provide examples of how external oversight has resulted in constructive change?

Four of the sixteen STAs identified strategies to conduct external oversight and subsequently make adjustments to the transportation budget. The following external oversight strategies were reported by STAs in the interview:

- The STA relied on a transportation commission and public participation in referendums to guide external oversight.
- Summer workshops put on by the STA provided direction on the implementation of agency-wide programs. The process of project programming was often explained in detail during the workshop.
- The STA was developing a planning oversight committee that would be staffed by governmental executives. The committee will authorize funds for projects within the 10-year plan.
- The STA formed an accountability committee responsible for monitoring the agency's effectiveness in regards to program and project delivery.

5.1 Does the process integrate resource allocation for capital improvements, system maintenance, and system expansion?

None of the sixteen STAs indicated that their asset management systems were integrated to allocate resources for capital improvements and system expansion. While one STA had a common database for its assets, the technology was not equipped to conduct an integrated tradeoff analysis. Most STAs operated individual asset management systems through different departments in the central office and delivered the outputs to the sub-areas of the state. A planning manager in one STA conducted tradeoffs between bridges and pavements for each district, while another STA indicated that cross-asset decision making occurred as part of the capital investment strategy process in the central office. A small rural state indicated that resource allocation and the balance between asset classes were based on current needs and the collective judgment of managers and executives.

5.2 Do the systems implemented for individual assets integrate their decision making process?

While none of the states have integrated their asset management systems to perform tradeoff analyses between different assets, six of the sixteen STAs indicated that individual asset management systems have been integrated to aid in the decision making process. The states that have implemented an integrated individual asset management system tended to have large populations with significant numbers of freeways and interstate mileage. Two STAs integrated decision making from individual assets through a performance-based planning process.

5.3 *Does the agency have cross-function teams to help integrate decision-making? How are those teams formed, used, sustained?*

Ten of the sixteen STAs used cross-functional teams on a regular basis. Four STAs formed cross-functional teams to assist in the project selection task. The cross-functional teams were formed from members of the bridge, design, planning, and finance offices.

Two STAs used cross-functional teams to derive performance measures for assets on the highway system. These teams included employees from the design, bridge, and planning offices.

Another STA formed cross-functional teams to assist in the pavement and bridge management process. These teams included members from the bridge design, highway design, and planning offices. They conducted field inspections to determine the condition of pavement and bridges. The planners participated in the field inspection process to understand the condition of the pavements considered for improvement.

Two STAs used cross-functional task forces to integrate capital investment decision making. One STA used cross-functional teams to assist in the development of intermodal activities within the department. Another STA used multidisciplinary teams to analyze safety issues within specific corridors. Design and traffic engineers will work with transportation planners, law enforcement, and EMT to define strategies for high accident corridors.

Four STAs did not respond to this question.

6.1 *Best practice examples: practical applications used by the agency for any of its assets.*

The following list identifies what each of the sixteen STAs considers its best practice in terms of resource allocation and asset management.

- One STA had difficulty in providing quality pavements throughout the state. The improvement of the pavement management program has led to increased smoothness and durability of pavements on the statewide level
- An STA developed asset management systems and introduced them to the planning process at different times. Many of these systems were developed to analyze data in different ways, with the different offices operating each system. This STA strived to integrate the process of asset management valuation by developing an integrated asset management platform that will allow the outputs from different systems to be simultaneously examined. Budgetary aspects will be integrated into the asset management systems to allow comparison of different asset conditions with budgetary input.
- An STA's project selection process must consider local interests while taking the statewide budgetary situation into account. The project selection process begins with the gathering of information on a localized level, with multidisciplinary teams programming the selected projects into the work program.

- An STA encouraged additional communication and cooperation between offices through the integration of its asset management systems. The asset management systems operate on the same functional platform, which facilitates communication and data integration between departments.
- An STA uses a pavement management system to forecast pavement deterioration and project selection capabilities.
- One STA developed a performance-based long range plan, incorporate annual goals with long-term objectives.
- An STA's planning process should address short-term deficiencies while considering capital improvement needs in the long term. A sound planning framework would ensure that these needs are being met on a statewide basis. The planning framework won awards from AASHTO.
- Before an STA implements an asset management system, it must be aware of budgetary constraints and tradeoffs that should be made. The asset management system must be tied into the state's budget, with the ability to make tradeoffs for different projects based on performance goals.
- An STA's capital improvement strategy must address needs while remaining within a reasonable budget for the state. The compilation of an annual report that relates the overall system condition to the planned capital investment for the upcoming fiscal year would ensure that needs are met while staying within the limits of a budget.
- A long-range transportation plan should address performance and capital needs annually with consideration for the yearly budget. The long-range transportation plan is significant in setting a vision and direction for the STA's transportation needs.
- An STA's project development process should address its needs in a concise and timely manner. The project development process is streamlined by consolidating the planning and NEPA steps.
- One STA realized that the quality of the collected performance data of its assets would lead to improved long-term performance. The improvement of data collection practices for all assets on the highway system to monitor future performance is a goal for this STA.
- Each program manager has developed a quantitative prioritization scheme for project selection. The project prioritization should affect the asset condition as reflected in performance measures. This provides accountability to each project manager in the STA in order to explain the project selection process in quantitative terms.
- Addressing the overall safety of the state highway system and the reduction of fatal crashes can be considered top priorities of any STA. A safety improvement program has been enacted that has reduced the number of fatalities on the state system in the previous two years. The safety improvement program has identified high-risk locations on the state system, and the funding has been dedicated to improving the safety in these areas.
- The development of extensive GIS capabilities across functional silos that allow a user to simultaneously analyze multiple assets on a corridor cross-section has proven to be useful in the analysis of asset performance for an STA.

7.1 What educational opportunities are provided to staff who deal with asset management issues?

The following list describes the educational opportunities that were provided to staff in the

area of asset management. Four of the sixteen STAs identified active educational opportunities.

- A two-day training seminar on HERS-ST was offered to STA employees and MPO staff. The seminar was run by the Federal Highway Administration (FHWA).
- Central office staff attends AASHTO asset management conferences, and district staff participates in NHI courses.
- A two-day asset management and funding allocation information session is held on an annual basis.
- The asset management working group is comprised of about 25 agency managers and engineers assemble on a monthly basis.

Conclusions

Probably the most satisfying finding of the survey is that many states identified their best practices as being related to the use of quantitative methods (asset management, performance management, asset condition data collection, and data/system integration) for resource allocation. This indicates the importance these STAs place on asset management.

One of the issues we found interesting is that all STAs manage highways, bridges, roadsides, etc. These facilities are quite similar and uniform in design between states; furthermore, uniformity is an attribute that all states have sought. Uniformity of the driving experience is one of the founding factors for the development of AASHTO, the MUTCD, and other national engineering guidance and standards. However, differences between STAs in allocating funds to projects, maintenance, and operations are quite amazing. Each STA has its own unique system for allocating resources and involving its partners (specifically MPOs and other regional organizations). However, most agencies are making cross-agency trade-offs based on more manual means than an agency-wide and asset-wide management system. They are using cross-functional groups and discussions with local governmental groups, regional governments, and appointed and elected bodies to make cross-asset class decisions incrementally. Although asset management systems are becoming commonplace, there still is great deal of human input and negotiating over criteria to reach final resource allocation decisions. A few STAs are still working with legacy resource allocation formulas based on geography, political input, and formulas that are unrelated to need or economic efficiency.

What we found most surprising is the flexibility of agencies to fund their own priority projects without being encumbered by a restriction in federal funds (category funds) or even by their own legislature. Most STAs have the ability to use state funds where they are needed, while still meeting federal requirements for federal funds. States with larger highway systems and larger populations receive a smaller portion of their entire budget from federal sources, thus giving them more flexibility. Although some agencies commented that a federal requirement makes it difficult to accomplish their own goal, none felt that federal requirements created an impossible barrier to achieve their state-level goals. In some cases the interviewee even thought that the federal requirements were useful because the state might not otherwise spend funds on such valuable activities as a safety review.

Although this chapter presented summary of agencies with disparate processes for resource allocation, the specific interview transcriptions are included in the project web page. Interested parties are welcome to view the actual interview transcriptions, yet we do not feel that they will provide any insight to those not directly involved, beyond what is presented in this summary (<http://www.ctre.iastate.edu/research/silos/index.htm>).

CHAPTER 3: IN-DEPTH CASE STUDIES

To obtain a more thorough understanding of how resource allocation worked at specific agencies, case studies were conducted. The STAs were identified by the project advisory committee with recommendations from the researcher. The Missouri Department of Transportation (DOT) was identified as the trial state, allowing the researchers to know what to expect and refine the questions to be asked. The Missouri DOT was visited by two of the researchers and helped to define the format for all future case studies. Although we learned much from the Missouri DOT no formal report of our findings are reported here. This was truly a process to let the researchers better understand what to ask.

Three STAs were selected by the advisory committee because of their reputation for good asset management process. These include the Ohio DOT, the Maryland Highway Administration, and the Florida DOT. Contact with each agency was first made with the individual who had the responsibility closest to being the agency asset manager. These individuals or their designees accepted the duty of working with the researchers and organizing interviews of key office staff. Although in each case the contract at the agency was given a list of questions, interviews often diverged from the scripted questions. Similarly, each case study followed the topic that the interviewee wanted to highlight, and, therefore, each case study was unique.

One or two of the researchers then traveled to the agency and spent one or two days to better understand the agency's process for allocating resources and bridging functional silos. From each of these field visits the researcher wrote a roughly ten-page discussion of the results. Ultimately, the STA personnel were allowed to review the case study for accuracy but not content. The researchers attempted to remain unbiased and accurate but had to rely on what they were told by the agencies. In all cases agency personnel were sincere and dedicated employees.

One common thread among all organizations was management through the use of performance measures. Since performance measures, like measures of congestion, may more easily bridge across functional silos than dollar measures like benefits and value, most STAs took a performance measurement approach. At the agency, performance measures sought to lower the barriers between functional silos and to heighten the importance of meeting the goals for performance measures independently of functional silos.

Ohio DOT Case Study

The Ohio DOT was selected because it has one of the strongest performance-based business plans and performance accountability systems of all STAs in the country. The Ohio DOT has roughly 6,000 employees, manages a highway system of almost 21,000 miles, and had a budget in 2007 of roughly \$2.3 billion, with roughly half from state sources and half from federal sources.

The Ohio DOT process for developing projects and allocating resources is very well-documented. The project development process has been standardized into steps. The number of

steps utilized depends on the scale and type of project, but the Ohio DOT has trained over 1,000 employees and consultants to make sure it is widely understood.

With respect to allocating funds to activities, there are six key elements that have led to the Ohio DOT's current resource allocation process:

1. Decentralization of the department in 1995, evolving both the responsibility for delivering the department's program to the districts (allocating resources) and for making the districts accountable for the performance of the transportation system in their district.
2. Establishment of the Transportation Review Advisory Council (TRAC), which was created by Ohio's general assembly in 1997 to bring an open, fair, data-driven system to the selection of major transportation projects. Major projects are considered to be any capital improvement project that costs more than \$5 million.
3. Documents and the processes they represent, including:
 - a. The Business Plan, which outlines the policy level of the resource allocation process and reports on the system's condition and performance and progress towards meeting statewide and district level goals.
 - b. The Funds Management Allocation Manual, which outlines the Ohio DOT's process for the management of fund programs and allocation of available funds to specific programs.
4. "Jobs and Progress Plan," a bill passed by the Ohio General Assembly in late 2003.
5. Leadership longevity within the agency and support for the resource allocation process. Gordon Proctor was the director of the Ohio Department of Transportation since 1999 (director Proctor left the organization in 2007). Prior to becoming director, he was Chief of Staff for the former director, and was instrumental in establishing the existing stewardship policy. Consistent and clear policy direction has institutionalized the resource allocation process and has even created buzzwords that are unique to the Ohio DOT.

It is clear from reading the documents described above, from the guidelines for the TRAC, and from the implementation of the "Jobs and Progress Plan," that there is consistent policy direction among each of these key elements. Although it is never the first objective or goal of each key element, the policy for each clearly identifies the dedication of sufficient maintenance and preservation funding to maintain the network at a sustainable, steady-state condition.

Decentralization

In 1995, the Ohio DOT decentralized management authority for delivering its program. Evolving authority and discretion over program delivery and expenditures to the district offices (Ohio has twelve districts) is tempered with open and objective performance measurement (performance measures are discussed in the business planning section). Because the central office keeps track of performance and projects future conditions through deterioration models, a good deal of healthy tension exists between districts and the central offices.

Prior to 1995, funds were distributed to districts evenly, with each district receiving the same operating budget, regardless of local conditions. As a result, the condition of the system was much better in districts where traffic volumes were low and where weather conditions were milder. Moving to a system where funds are distributed based on needs took several years to occur. This resulted in some districts receiving fewer funds than in the past and some receiving more. The move to performance-based distribution evolved over several years, but eventually the process was driven by achieving an acceptable and sustainable condition that was consistent statewide (“steady-state”).

Although the condition of the highway system is measured centrally, and funds are distributed centrally (through the funds management process), the districts are responsible for their own programs and to develop their own work plans. Each district can choose what it wants to do internally and what it wants to contract out. This includes design work. Some districts have design teams, while others do not. Some choose to use consultants for design, some have another district do the design, and some have central office production staff do the design. It is up to each district to determine an approach to project delivery (within the department’s project delivery process). To assist in the management of funds, districts are allowed to roll over funds they don’t spend into the next year. This allows districts to save funds to cover risk or to conduct a minor capital project. In addition, it provides district personnel with an incentive to be frugal with funding, because anything that is not spent remains in the district. Districts also have the incentive to minimize overhead costs. For example, any unneeded equipment or unneeded right-of-way can be disposed of by the district, and the funds received by the sale remain in the district’s account.

District field staff is organized by county. At the county level, field staff members are allowed to participate in work planning. Throughout the year, the field staff notes system deficiencies in the county. Then at annual work planning meetings, county staff members determine maintenance projects that need to be accomplished and the total labor hours required, and decide what part of the workload they want to do themselves. The remainder of the work goes to contractors. Through the county garages, a maintenance work plan is established as part of the overall district work plan. Each district has a tactical program delivery team that meets every month. The team develops the work plan and then reviews progress on the schedule, budget, and work progress. The team includes district-level individuals representing design, construction, maintenance, and planning.

Transportation Review Advisory Committee

The Transportation Review Advisory Council (TRAC), created by the Ohio General Assembly in 1997 to bring an open, fair, data-driven system to select major new transportation projects, is composed of the director of Ohio DOT and eight appointees chosen as a result of their experience in transportation, business, or economic development. The governor names six members; the president of the Ohio Senate names one, and the speaker of the Ohio House names one. Although the Ohio DOT and the Director support and strongly influence the project selection process, the TRAC alone has the authority to select major new transportation improvement projects, thus protecting the agency and its staff from political pressure and other outside influences.

The amount of money available for new major-capacity projects is certified to the TRAC by the director of the Ohio DOT after funds for system preservation are determined. Historically, the TRAC has had about \$300 million per year to pay for projects including design, right-of-way, and construction. However, the amount of construction funding managed through the TRAC has increased as a result of the passage of the “Jobs and Progress Plan” passed by the General Assembly in 2003.

A major new project is one that will cost Ohio DOT more than \$5 million or involve a bridge more than 1,000 feet long and does one or more of the following: reduce congestion, increase mobility, provide connectivity, or increase a region’s accessibility for economic development. In general, the TRAC puts a priority on state and federal highways. Generally, the new capital projects for the state system will be championed by the district office. Since the districts have discretion over their budgets, they have the ability to fund a conceptual plan for a project which will provide the information required for a TRAC application. If the project is within an urbanized area, improvements must be consistent and included in the MPO’s Transportation Improvement Program (TIP). The TRAC requires that the MPO rank the project using the MPO’s own criteria before TRAC will consider the project.

The TRAC holds six public hearings around the state from August through October each year. A draft project list is published each December. TRAC candidate projects must be in the state highway system, and candidate projects may be identified by the Ohio DOT, Metropolitan Planning Offices (MPO), or local government and transportation authorities (e.g., transit authorities). Projects generated through the Ohio DOT must go through the funds management process to make sure that the request is consistent with funding allocation. All candidate projects are then scored by the members of the TRAC, where points are given for transportation efficiency, safety, economic development, and special attributes, such as the ability to generate matching funds from local or private sources.

Business Plan

The business plan starts with a fairly broad mission and a list of values. Next, the business plan lists the department’s five goals. These five goals are consistently identified in departmental manuals and plans. The first three goals are statements regarding attributes of system performance and quality of customer service (e.g., safety, economic development and quality of life, and reduced travels and travel time variability), that are largely open-ended goals without specific limits defining when the goal is achieved. The fourth and fifth goals are internally focused. The fourth goal, shown below, sets very specific measuring criteria for goal achievement and addresses systems preservation:

“Ohio DOT will achieve and sustain a steady state of manageable and predictable deficiencies in transportation system conditions, with an \$825 million annual system preservation budget.”

The fifth goal deals with the internal efficiency of the Ohio DOT and limits the number of employees, but is also open-ended in defining efficiency.

The business plan's discussion of internal operation highlighted the three following issues:

1. Dedication to system preservation, as measured by the condition of the system.
2. Efficient use of operating resources, predominantly measured by keeping full-time equivalents and payroll expenditures at constant levels, while maintaining a high level of on-time project delivery.
3. Delivery of a system condition that can be sustained as measured, by projecting the system condition to be maintained at a consistent condition over time (keeping the system at steady state).

The annual business plan evaluates the progress being made toward business goals and strategic initiatives. For example, portions of the 2006 and 2007 business plans reviewed progress towards the completion of comprehensive training for technicians. However, the majority of the plan covers the status of the "Organizational Performance Indicators" (OPI) on a district-by-district basis.

The OPI is organized around identifying the condition of infrastructure elements, defining levels of condition that indicate a deficiency, and setting goals for the percent of the state or district system that is deficient. Although measurements of condition are done on a numerical scale (e.g., 0 to 100 or 0 to 9), goals are set based on the percentage of the condition of individual elements falling above or below the deficient condition level (e.g., percent of highway pavement falling below a condition index of 60, where 60 or below is considered deficient).

The OPI divides infrastructure into three categories: pavements, bridges, and overall roadway and roadside conditions. Pavements are divided into three system levels: high priority highways (interstates and other multi-lane divided highways), urban highways (state highways within urban areas), and general highways (two-lane highways not in urban areas). Pavement condition is measured by a composite measure (combining several types of pavement distress), rated on a score of 0 to 100. For each system level, a minimum condition rating is considered deficient, and each level is given a goal for the percentage of the system that may be deficient. Pavements are evaluated annually. Bridges are also evaluated annually for condition in four areas: general bridge appearance, floor condition (horizontal structural elements), wearing surface, and paint condition. Each category of condition is given a condition rating, below which is considered deficient. The remaining evaluated elements are simply rated as deficient or not deficient. They include:

- Drainage obstructions
- Guardrails
- Litter
- Pavement markings
- Pavement deficiencies (ruts and potholes)
- Sign deficiencies
- Pavement edge drop-offs
- Vegetation obstructions

These elements are rated every year, and goals are identified at the state and district levels by number of deficiencies.

The business plan also includes non-highway infrastructure performance measures, including crash frequency and severity, construction project quality and project on-time performance, rolling stock performance and productivity, building and facilities condition, budget controls while meeting minority purchasing and inventory efficiency, information technology goals (employee access to network and automation tools), on-time plan delivery and quality performance, and agency financial performance. Thus, the OPI measures cover asset condition, safety, business process/technology, and project delivery. The balance of covering all or most of the important areas of performance, safety to project delivery, financial performance to construction quality, is important to bridging silos. Not including some areas of performance (e.g, safety) or not emphasizing one area sufficiently could lead to less than efficient resource allocation decisions.

Every quarter, a leadership meeting is held where the leaders of the district offices meet with the leaders of the central office. Exception reports are generated prior to the meeting, indicating any performance measures that exceed the minimum levels established for the districts. If a district is performing below a minimum performance level, the district deputy director (equivalent to a district engineer) must explain how the district intends to alleviate the deficiency. Exceptions also provide input to the Funds Management Committee when they are looking at funding allocations.

Funds Management Allocation Manual

The “Funds Management Allocation Manual” describes the operation of the Funds Management committee and programs they manage. The Ohio DOT director created the committee in 2001 to make recommendations regarding how the department should allocate available funding, based on the condition and needs of the transportation network. The Funds Management Committee is chaired by the deputy director of the Division of Planning, and includes district deputy directors (the equivalent of district engineers) from three districts who represent urban and rural districts, Central Office deputy directors for Local Programs, Finance and Forecast, Facilities and Equipment, and Highway Operations, and office managers from Traffic, Safety, Planning, and Structures; and managers of individual funding program managers.

The primary responsibility of the funds management program is to develop a four-year budget plan for three scenarios: the expected levels of revenue, twenty percent below the expected, and twenty percent above. Because the Fund Management Committee is a large committee that includes district staff, it is designed to generate annual budgets and allocate funds in sync with agency’s biennial budget. The Capital Programs Committee, a small committee consisting of central office staff members, oversees week-to-week program progress, to track and adjust budgets with respect to current expenditures and revenue. The primary objective for budget allocations is to preserve the system at or above OPI goals, by allocating funds to the districts at a level necessary to preserve the district’s highway network at or above condition goals. Funds above those needed to preserve the system are then allocated to improvements and other statewide programs. Unless defined by legislation or policy, the funds are divided into programs,

based on preserving the highway system in a sustainable manner first, and then to making improvement to the highway system.

The Funds Management Committee also prepares a ten-year financial plan. This plan is based on projection of condition of the bridges and pavements and how they will change through time, with regard to funding allocations and based on projects of future revenue. Revenue projects cap the cost of debt serviced from state funds at twenty percent of annual state revenue and debt serviced from federal funds at ten percent. Given that the Ohio DOT budget is roughly fifty-fifty, federal and state, this is an overall cap on debt service of fifteen percent of revenue. The Ohio DOT is well below the stated caps.

The ten-year plan acts as a foundation for annual allocations and four-year plans. Although the ten-year financial plan has specific dollar allocations to programs projected out to ten years into the future, it is understood that this is just a plan to provide consistency among short-term funding allocations.

There are three categories of funds in the allocation process.

1. The first category is the allocation of funds to the districts for maintenance and preservation. The funds allocation management process is also intended to provide the districts with guidance on treatments and processes to help them achieve a “steady state” condition within each district: moving from a “reconstruction” mode to a “preservation” mode.
2. The second category is statewide programs. Each statewide program is allocated funds and then managed through a statewide program manager.
3. The third category is funding programs for local governments. Since local government funding is not the issue in this document, local programs are not discussed here.

The funds management committee makes recommendations regarding distribution of funds, district-by-district (there are twelve districts) for the following programs:

- District Bridge Program: Preservation and replacement of bridges. Forty percent of the distribution to districts is based on bridge inventory (e.g., deck square footage), and 60 percent is based on the most critical statewide bridge deficiencies (need-based).
- District General Allocation: Supplemental funding for unanticipated needs for preservation programs (\$20,000,000 statewide). Funds are distributed based on lane miles per district.
- District General System Program: Funding for preservation and maintenance of rural two-lane roads. Funding levels and district distribution are based on maintenance and preservation needs to maintain pavements to a system goal.
- District Maintenance Contract Program: Oversight of Ohio DOT contracting for things like stripping and marking, vegetation control, and other roadside maintenance tasks.

District allocations are built up from county work plans.

- District Priority System Program: Funding for preservation and rehabilitation of the priority system (with the exception of major rehabilitation projects that are funded from a statewide program). Funding distribution is based forty percent on inventory and sixty percent on the most critical statewide deficiencies in a district.
- District Urban Paving Program: Funding for surface treatments and resurfacing projects on state and U.S. routes in urban areas. Funding is allocated to districts based on the number of miles, condition of pavements, and volume of traffic carriers.

Funding for pavement programs is based on need. The funds allocation committee projects future needs, based on a pavement deterioration model (the model projects the condition decline per year). The deterioration model makes assumptions regarding the reconstruction of pavements during a given analysis period, but the actual allocation of funds to activities during a given year are determined by district managers. However, the measure of the district's management performance is based on the district's ability to meet OPI goals.

Several programs are managed by Central Office, as opposed to being managed through a district office. Although a project may be selected through one of the central offices, project delivery is managed through a district office. Statewide programs select projects through a statewide evaluation of competing projects. Major improvement projects, selected through statewide programs, must be reviewed, scored, and selected by TRAC. The statewide programs are listed below. The most important programs are listed first for the ease of the reader.

- Major new programs: Funding for projects that increase mobility, provide connectivity, increase the accessibility of a region for economic development, increase the capacity of a transportation facility, or reduce congestion throughout the state. Funds allocated to major new programs have typically been determined by subtracting from the annual revenue, the funds required to preserve the system and miscellaneous off-the-top programs (e.g., the Amish Buggy program and the major bridge program). It is anticipated that an additional \$500 million per year in funding will be available for major projects through federal and state sources through the "Jobs and Progress Plan." Although candidate projects are prioritized and selected by the fund management committee, they are only candidates for the TRAC to consider for funding.
- Priority System Major Rehabilitation Program: Funding for major rehabilitation projects of interstate and multi-lane highways statewide. These are major rehabilitation projects which are recommended by the districts, but ranked and selected by the program committee. This program has a budget of \$150 million per year.
- Major Bridge Program: Funding for 146 structures, which are mostly bridges over 1,000 feet in length, or bridges over the Ohio River, for rehabilitation and replacement. Candidate projects are evaluated and prioritized by the Major Bridge Program manager. Funding levels are established to meet system condition goals.

- Safety Program: Funding for highway safety treatments or corrective activity, designed to alleviate an existing or potential safety problem.
- Amish Buggy Program: This is a small program, intended to make the transportation environment safer for horse-drawn vehicles and motor vehicles. Funding goes toward improvements like shoulder widening and grading, creation of pull-offs, and similar mixed-use improvements.
- Building Major: Funding for replacement and maintenance field facilities.
- Geological Site Management Program: Funding for repair of embankment slips, landslides, rockfalls, and projects involving underground mines and erosion projects.
- Intelligent Transportation System (ITS) Operation and Maintenance: Funding for the operation, maintenance, repair, replacement, and upgrade of freeway management systems.
- Noise Wall Rehabilitation Program: Funding for the repair, rehabilitation, and landscaping of older, pre-existing noise walls.
- Noise Wall Retrofit Program. Funding for retrofitting existing roadways with noise barriers.
- Railroad Grade Separation Program: Funding to construct grade separation in communities most affected by increasing railroad traffic and to ensure access to safety, health, and educational facilities.
- Railroad Safety Program: Funding for highway-railroad grade crossing safety.
- Rest Area Program: Funding for replacement and rehabilitation of existing rest areas.
- Statewide Program: Funding for projects that do not qualify for other capital programs, but respond to an unanticipated need.

The Capital Programs Committee deals with the current year's fiscal program. The committee consists of ten members from Planning, Local Programs, Finance, Estimating, and major statewide program managers. This group monitors the annual progress of expenditures in comparison to budget and meets every other week. When abnormalities are identified, program managers and districts are contacted to explain the circumstances.

Jobs and Progress Plan

To further drive home the Ohio DOT's dedication to preservation of the highway system, the Ohio legislature adopted the "Jobs and Progress Plan" in 2003. Although it was a transportation revenue bill, it raised fuel taxes by six cents and raised vehicle registration fees, to be phased in over a three-year period. Although the increased revenue was to be shared with local

government, the goal of the Ohio DOT was to add \$250 million in additional funding per year for new projects and dedicate the funds to construction over a 10-year period. The commitment to the ten-year program was made through an interesting challenge to Congress to raise federal revenues paid to the state of Ohio to match the state's commitment to new highway construction. The plan asks Congress to eliminate the federal tax subsidy on fuels that use ethanol as an oxygenate for gasoline, and by returning a greater portion of the federal fuel tax generated in Ohio back to Ohio. At the time, Congress was working on the re-authorization of the federal transportation policy and has since passed the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFTEA-LU).

There were five major commitments made in the "Jobs and Progress Plan."

1. The first was the commitment to funding \$250 million in new construction per year (the State of Ohio's half of the commitment).
2. The second was to reduce congestion at specific locations in and around Ohio's urbanized areas.
3. The third was to maintain (preserve) the system's "steady state," given an acceptable performance level.
4. The fourth was to increase the amount of money spent on highway safety. The funds dedicated to improving high-crash rate location were increased from \$30 million to \$60 million.
5. The final commitment was to complete a statewide corridor system to support freight movements across Ohio.

Assessment of How Things Work from the Field

A site visit was scheduled, where we met with several Ohio DOT staff members. The meetings and interviews included the individuals listed below. Many of the issues discussed in interviews were included in the prior sections. However, listed below are issues covered in the interview, in addition to the discussion above.

- Suzanne Rhodes, Urban and Corridor Planning
- Julie Ray and Daryl Weininger, Finance
- Leonard Evans, Systems Analysis Planning
- Tim Keller, Bridges
- Dale Schiavani (planning administrator), David Ray (management administrator) and Mike Herceg (Bridge and Pavement Management engineer). Note: District 12 includes the Cleveland Metro.
- Howard Wood, Division of Planning

The Ohio DOT tends to identify and define processes for activities like project development, funds management, long-range planning, etc. These activities have written processes that spell out all necessary steps, identify required communication between offices, and encourage uniformity and efficiency in processes. For example, the Project Development Process (PDP) has taken nearly three years for the agency to document. It is founded on the principles of

encouraging communication and avoiding duplication. Roughly 1,300 employees and consultants have been trained in the PDP so that it is broadly and consistently understood.

As another example of how the Ohio DOT process requires cross-office communication, the agency recently completed a long-range plan. For long-range planning, the state highway system is broken into twenty-six corridors (trade and travel corridors). To assess needs and develop corridor plans, multi-office teams were used to develop high-level, multi-modal plans for each of the corridors. These included representatives from the offices of Planning, Safety, System Analysis (infrastructure condition data), Geometric Design, etc.

The process of working in cross-office teams has not always been the culture for the Ohio DOT. In the past funding was allocated to the districts with separate designations for bridges and pavements. Often, the districts would develop plans for pavement and bridgework separately without considering the continuity of system condition. Now, although the allocation of funding to the districts is calculated partly based on the condition of individual assets, funds are provided to the districts without designating the amount of funding that must be spent on any part of the system within the district. Although district officials have the flexibility to direct funding to the preservation of individual assets in their geographical region, they have access to the same asset condition information that was used by the central office to determine the district allocation and they are held accountable through performance measurement for condition, safety, and operation of highways across all asset categories.

The program delivery process is supported by a computer software system called Ellis. Ellis is officially a project tracking system, but it does much more than just track projects. Ellis is a statewide computer database that includes condition and history information on segments of the highway system. The asset condition data are used within Ellis to project future conditions through deterioration curves (performance models). Deterioration curves have been developed for the distribution of pavement types and weather/soil environments experienced in Ohio. Although Ellis does not include the capabilities of a true pavement management system, it does allow for the forecasting of future needs and conditions. The Ellis also includes and tracks the majority of the sixty-five measures that the Ohio DOT uses in developing its performance measurement dashboards. This includes all the OPI information so that districts and the central office can track the OPI.

In the past, the Ohio DOT had a pavement management system that selected and recommended certain preservation treatments for the department to conduct. However, this system was scrapped as part of the reorganization and decentralization in the mid-1990s. Although the Ohio DOT clearly has the capability (data and expertise) to maintain a pavement management system, the department has chosen to not to implement such a system, believing that it is best to leave project selection and scheduling in the hands of district managers.

Projects enter Ellis as candidate projects (conceptual projects) and once in Ellis, projects are tracked as they move through the project development process, ensuring that projects follow the established project development process. Ellis tracks more than fifty financial and progress measures of a project's development.

Summary

The Ohio DOT is directed towards a global optimization, given financial and performance constraints when making resource allocation decisions, rather than seeking a performance sub-optimization within silos. Strong management direction is given for a systems approach to resource allocation. Although the Ohio DOT has specific actions that have been important to the evaluation of its current resource allocation systems (e.g., decentralization, development of TRAC, development of the Funds Management process,), the Ohio DOT's process can be characterized by the following attributes:

- Decentralized decision-making with very specific and public accountability mechanisms for system conditions
- A balanced performance measurement system that is or attempts to be comprehensive in its accounting for all attributes of system performance.
- Consistent prioritization for preservation first in funds allocation
- Consistent, widely understood, and well-documented process for program delivery
- Requirements for open and multi-office community communication, which runs through the organization to the county garages, the district offices, within the central office, and between districts and the central office

Maryland State Highway Administration Case Study

The Maryland DOT is an umbrella organization for several state-level transportation agencies (administrations) that operate relatively independently with overlapping revenue sources. With the exception of the Maryland Transportation Authority (the toll authority), all Maryland DOT modal agencies are funded out of a single-state transportation trust fund. Because all the administrations report to the same department, they generally have parallel goals and objectives. The following administrations report to the Maryland DOT:

- The Maryland Transportation Authority operates toll roads and toll bridges and operates its own police force that works in coordination with the Maryland State Patrol, off and on its own facilities.
- The Maryland Transit Administration operates transit services throughout the state, including paratransit services, local fixed routes and commuter route bus services, light rail, and commuter rail services.
- The Maryland Port Administration is responsible for the promotion, development, and administration of the Port of Baltimore.
- The Maryland Motor Vehicle Administration is responsible for vehicle licensing and registration, driver licenses and testing, and vehicle records.
- The Maryland Aviation Administration operates the Baltimore/Washington Airport and the Martin State Airport, a general aviation airport in the Baltimore area.
- The Maryland State Highway Administration (SHA) operates, maintains, and constructs all state roads, with the exception of tolled roads.

The secretary of the Maryland DOT is a member of the governor's cabinet, while the administrator of the SHA is a professional staff position, and the current administrator is career transportation professional. This case study focuses only on the SHA, but it is important to understand that the SHA must work within a policy framework that involves other DOT administrations and supports the Maryland DOT's work to satisfy the policy direction from the state's administration and legislature, the Maryland General Assembly.

It is also important to draw the distinction between the missions of the Maryland DOT and the Maryland SHA. The DOT largely operates at a policy level. Although the transportation improvement programs for all administrations are consolidated by the Maryland DOT for annual approval by the general assembly, the SHA develops the highway program relatively independently, following its own business processes and its own legislatively defined needs-inventory process.

A prior review of the Maryland DOT portrayed the relationship between the DOT and its subordinate administrations as being very top-down, with policy implemented by the Maryland DOT and the administrations acting as the vehicles for implementing that policy (*ii*). Although the relationship could scarcely be considered bottom-up, we did find flexibility between Maryland DOT policy direction and operational and program decisions made at the SHA. Although in theory it might appear as though the program is driven from the top down, in reality the flexibility provided to the administrations allows for independent operational actions, program management, and program development decisions at the administration level.

The Maryland DOT prepares a transportation plan that is largely a policy document, while the administrations produce their own business plans and have their own goals, objectives, and performance measures. Goals and performance measures of the Maryland DOT are set through state-level policy, while the administrations tend to be more flexible and focused on current business goals as opposed to goals set by policy. Policy goals tend to be quite broad and seek to achieve general social objectives (e.g., encourage smart growth). The Maryland DOT-level goals and performance measures and those of the administrations often have a similar focus but are not necessarily the same. To measure performance at the policy level, the Maryland General Assembly passed a law in 2000 requiring that the Maryland DOT produce an annual report on the DOT's progress toward transportation goals and benchmarks for the long-range transportation plan (twenty years) and for the shorter term Consolidated Transportation plan (six years). The report establishes six- and twenty-year performance targets. The law requires the Maryland DOT to discuss induced travel, the share of non-single occupant vehicle modes, congestion indicators, the cost-effectiveness of investments for congestion mitigation, and the costs per passenger per line. The "Annual Attainment Report on Transportation System Performance" has forty-five measures, thirty of which are tied to the state's transportation plans (*iii*). Therefore, the goals in the Maryland DOT's transportation plan largely parallel the objectives identified in the attainment report.

During the period 2006-2007, The Maryland SHA managed annual revenue of almost one billion dollars. Approximately 20 percent of their funds are from federal sources while the remainder are from a variety of state sources. The SHA operates a highway system of 5,614 miles in a rather compact state. The overwhelming majority of the state's roadways are controlled by local

jurisdictions; in some cases, these local jurisdictions are very large, sophisticated organizations (for example, Montgomery County in the Washington D.C. area and the Baltimore City and Baltimore County areas). The SHA does not have authorization to raise revenues through tolls, but its sibling organization, the Maryland Transportation Authority, does have toll authority. The SHA has used the Authority's tolling capabilities to its advantage and has recently used tolls to accelerate a very large and strategically important highway project.

In 2005, the SHA prepared its first formal accomplishment report ("Annual Report") since becoming part of the Maryland DOT in 1971 (*iv*). Although there had been many internal documents in past years, the 2005 report was the first public and widely distributed report. The annual "Report on the SHA Business Plan and other Top Accomplishments" is organized around the goals and objectives identified in the SHA's business plan (as opposed to the Maryland DOT's more policy-oriented plan). Results-oriented business planning has generally created a sense of government accountability and trust in the SHA's ability to be a good steward of the public's investment. The DOT requested a revenue increase and the General Assembly and the state's administration created \$237 million of new funding for the Maryland DOT by nearly doubling vehicle registration fees and increasing other miscellaneous fees in 2004. (*v, vi*) Federal and state funding and user fees flow into the state transportation trust fund and then are allocated to each administration through the Consolidated Transportation Plan. Although the allocation of new funds will be based on the needs of all of the administrations under the Maryland DOT, the majority of the new revenue will flow to the SHA for highway improvements and preservation.

Leadership

As noted above, the secretary of the Maryland DOT is a member of the governor's cabinet while the administrator of the SHA is a professional staff position. The current administrator, Neil Pedersen, was first made director of the Office of Planning in the early 1980s, became deputy administrator/chief engineer for Planning and Preliminary Engineering in 2000, was appointed acting administrator in 2003, and was appointed administrator later in 2003. The prior administrator held his position for seven years, and the administrator prior to Pedersen's predecessor held the position for twelve years. All were and are career transportation professionals. The consistency and continuity of professional management provides stability, and being institutionally housed within a broader agency reduces, but does not eliminate, political pressures to direct the highway program.

The SHA's program development is further partly shielded from the political process by Maryland state statutes. The SHA is required to take input from local officials and from the legislators at the county level (input is received from local officials and state legislators within a county, which will be explained in a later section). The information given to the SHA at the county level is input into the SHA's Highway Needs Inventory (HNI). Once the program plan is developed, taking into account county input, the legislature has the opportunity to review and approve the program. However, legislative action is limited to eliminating items in the program, not inserting projects into the program. To each annual session of the Maryland General Assembly, the governor must submit a budget for state government that is fiscally constrained (expenditures cannot exceed expected revenue). With the exception of budgets for the general assembly itself and the judiciary, the Constitution of the state of Maryland restricts the power of

the General Assembly to striking or reducing budget items. To ensure that the budget remains fiscally constrained, the General Assembly cannot add items. As a result of their inability to insert projects into the program plan, the General Assembly members concentrate on the process and justification for generating the highway improvement plan, the improvement plan's equity, and ensuring that funds are being spent effectively and efficiently (financial stewardship). Asset management systems help demonstrate that the SHA's leadership understands and can present the consequences of spending more or less on an individual fund category and that there is a rigorous and justifiable procedure for developing the improvement program for that fund category. Although the SHA does not yet have asset management systems for all fund categories, it does have them for the largest programs (in terms of dollar amounts), pavement and bridge preservation, to help de-politicize the distribution of funds from these large funding categories.

Seeing the importance of asset management, SHA leadership has largely been the driving force for the use of asset management within the Maryland DOT and within the SHA's peer administrations. In 2003, Maryland elected its first republican governor since Spiro Agnew left office to become vice president in 1969. This created some distrust by members of the General Assembly, who believed that a republican governor in a largely democratic state might encourage a more politicized process for project selection. However, the administrator of the SHA believes that the ability to show that there is an analytical basis for priorities has protected the agency from accusations of politicizing the project selection process.

Program Development Process

Three major inputs feed into annual development of the six-year highway improvement plan. All are interactive, so dividing them into three separate processes is not entirely correct but makes the inputs easier to describe. They are as follows:

- Business planning and performance measurement process
- Asset management
- Highway needs inventory

Business Planning and Performance Measurement

The SHA prepares a four-year business plan that is linked to six goal areas. The SHA has been preparing a business plan since the late 1990s, and the goals and order of the goals have changed over time (*vii, viii*). Each goal of the SHA has a Key Performance Area council that includes senior managers, who oversee progress the agency is or is not making towards its goal. The six key goals are as follows:

- Highway safety
- Mobility/congestion relief
- System preservation and maintenance
- Efficiency in government
- Environmental stewardship
- Customer service and satisfaction

Under each goal are eight to fourteen objectives, and progress toward each objective is measured through inputs, outputs, and outcomes. For example, under the SHA's goal of system preservation and maintenance, the objective for snow removal uses as an input "inches of snowfall by region (district)." As an output, the SHA's snow removal activities are measured by "tons of salt per lane mile per inch of snow," and outcomes are measured by "number of hours required to regain bare pavement after a winter storm event." All three are measured, and all are performance measures for snow removal. There are fifty-nine separate objectives. Each is supported by at least one input, output, and outcome measure, and some objectives have more than one input, output, or outcome measure. Having a large number of categories for any financial or performance measurement attributes is a characteristic of the Maryland SHA. The SHA also manages a large number of separate funds (as will be seen later in this report). This may help the agency to maintain balanced resource allocation between functional areas.

All objectives have a numerical value for their achievement and a time period over which they are to be accomplished. For example, Objective 1.1 "Injuries and Fatalities," defines a specific number of fatal and injury traffic crashes per year that are to occur on all Maryland roads by the end of 2006 (this is actually a crash reduction goal).

Safety's rise to the top of the list of goals is probably most directly a result of the influence provided by top management. As the governor's transportation safety representative, the current administrator is passionate about traffic safety. As a result, the performance measures and performance goals for traffic safety include safety measures that the SHA may influence, but may not control. For example crash frequency goals are stated for the entire highway system, although SHA owns and operates only about 17 percent of the highway system in the state (local governments operate the majority). Other safety performance measures in the SHA business plan that are outside the control of the SHA include seat belt use, aggressive driving, and impaired driving. Although these objectives are more directly influenced by the enforcement officials who are not part of the SHA, the administrator has the ability to influence enforcement programs through federal National Highway Traffic Safety Administration (NHTSA) funding, which is managed through the governor's traffic safety representative's office. Further, having both responsibilities provides the administrator with the ability to move resources from infrastructure/engineering improvements to non-infrastructure, driver-oriented, safety programs (funding for special enforcement programs, seatbelt education, crash report improvements, etc.). Although the administrator has the flexibility to move funds between programs, this authority has not yet been exercised.

To the extent that it is appropriate, the performance measures are reported quarterly. Some of the performance measures are not measured in every quarter (e.g., snow removal) and some are measured only annually. On a quarterly basis, the performance measures are calculated, and the district engineers review the measures within each district with agency management. District management is expected to explain any deviation from performance objectives within the district.

Although the agency identifies safety and mobility as the number one and two goals, respectively, we were told in discussions with staff that when allocating financial resources,

preservation and maintenance were the first activities to be funded. The third agency goal is system quality, for which very specific and measurable performance targets are identified (e.g., pavement ride quality). Thus, these targets provide a stable measure against which to judge the agency's maintenance and preservation performance. Staff in the agency saw preservation and safety as being synergistic rather than competitive. In other words, a highway system that complies with current design standards and is well preserved is likely to be a safe highway. The notion that investment in safety and preservation are synergistic may be due to the fact that the agency has had sufficient resources to fund its safety program in the past and lacks an asset management framework to trade safety improvements with improvement to the quality of physical assets.

Asset Management

Maryland has had thorough asset management systems for some categories of assets for many years (e.g., pavement management). However, the SHA administrator is promoting the development of asset management systems for as many asset categories as possible. This will result in more data-driven resource allocation decision making and the ability to estimate the asset's condition under alternative funding and use scenarios. In the fall of 2004, the administrator appointed the deputy-director of the Office of Planning and Preliminary Engineering to lead an initiative to implement asset management across the agency. Originally, the SHA's lead for Asset Management was in the Office of Materials Technology (the home of the SHA's mature Pavement Management System). The lead was then moved to the Office of Planning and Preliminary Engineering to provide Asset Management a home outside of an office responsible for a specific asset category. An Asset Management steering committee was formed, with representation from across the department, to support the administration's Asset Management leader. The Asset Management steering committee, at the time of our interview, was developing an implementation plan.

One of the first steps in the implementation plan was to decide which asset categories to tackle first, with respect to building condition-based management systems. The committee first went through all the categories of funds and identified those fund categories that would benefit most from an asset management system approach. The categories selected were funds for physical assets (e.g., signs, pavement markings, lighting). Fund categories for capacity improvement, safety, and agency operation were not included. Next, the committee ranked categories according to how much the asset category would benefit from an asset management system approach. Pavements and bridges were the two top priorities, but the SHA already had mature management systems for both pavements and bridges. The next asset categories to be targeted for asset management system approaches were the following:

- Signals
- Coordinated Highways Action Response Team (CHART, Maryland's statewide ITS operation system)
- Drainage
- Pavement markings
- Signs
- Lighting

The SHA spends a little over \$600 million per year on system preservation and maintenance, and the funds are allocated to about two dozen capital funds. The agency sees asset management supporting the management of its resources at two levels. At the top level, the SHA sees asset management helping divide resources among the capital funds to minimize long-term costs while meeting infrastructure condition targets. At the second level, the SHA sees asset management helping to achieve data-driven decision making within each capital funding (e.g., bridges, pavements, guard rails).

One of the success areas for the SHA's asset management initiative has been its development of drainage structure management systems. These systems have grown out the agency's response to the National Pollution Discharge Elimination System (NPDES), which requires permits for surface runoff discharged into surface waters. Since the SHA has a large number of drainage structures, surface ditches, outfalls, runoff ponds, etc., the SHA is inventorying these features and will monitor the condition of its drainage structures, routinely assess the system, and initiate remedial work as needed.

To develop the annual budget, each of the fund managers meets with the administrator every spring and presents his/her needs. Since there are always more needs than available funding, each fund manager, to the extent possible, will try to demonstrate how changes in the fund allocation will impact the condition of the asset he/she manages. For asset categories with mature management systems (e.g., pavements and bridges), identifying the condition impacts as a result of varying levels of funding is possible, but this is not always possible for fund categories without management systems (e.g., lighting). As a result, funding levels tend to be set based on prior funding levels and prior experience with the adequacy of funding in past years.

Once the overall fund amount is set at the agency level, the funds are then distributed to the district based on an asset count basis (e.g., lane miles, bridge deck surface area, number of traffic signals) and on usage (vehicle miles traveled and population). At the district level, the districts have the flexibility to direct their own preservation and maintenance programs based on asset condition targets. For example, each district has access to a pavement project selection tool that allows district-level managers to forecast the impacts of various pavement preservation strategies at locations throughout the district's highway network. The districts are restricted to spending funds allocated for pavement preservation on pavement preservation, but they are not restricted to particular projects.

On a quarterly basis, the performance measures are calculated, and the district engineers review with agency management the measures within each district. District management is expected to explain any deviation from the performance objectives within the district.

The SHA categories of funding are internally generated, and funding can be moved from one fund to another at the discretion of the administration. However, staff at the administration generally see the division funds distributed into very narrowly defined categories as a means to protect the budgeted level, particularly for small programs. Large budget categories (e.g., pavements preservation, bridge preservation, and maintenance) are the most likely targets for budget cutting, and the SHA has management systems that can identify the implications of

reducing a fund category, thus protecting the asset category from budget cuts. On the other hand, small and narrowly defined budget categories for assets that do not yet have a management system (e.g., signals, pavement markings, buildings) have small budgets and are unlikely to be the focus of budget cuts. These categories are easier to justify than large funds.

Project and Program Development Process

The Statewide Transportation Improvement Program and the modal administrations' budget requests for the sixth year of the Consolidated Transportation Plan are developed each fall, adding another year to the end of the six-year plan and allowing the DOT to prepare a six-year comprehensive program for the General Assembly by January 15 of each year. The SHA priorities for budgeting are maintenance and preservation of the existing system, support for the SHA's own operation, and, lastly, major improvement projects. The SHA's capital budget is divided between major projects and the rest of the capital improvement program (largely preservation, maintenance, and minor improvement projects). Major projects are those that increase the capacity of the highway system or involve bridges and interchanges that may not change the system capacity but which represent a large construction expenditure. Although the district offices are generally allowed to select maintenance and preservation strategies and specific preservation projects, selection is directed by the district's condition targets, budget, and a common tool to select project and preservation strategies. Major projects are programmed centrally with input from the districts, the SHA's own management systems, local jurisdiction's priority letters and the Highway Needs Inventory (HNI).

The HNI is a technical reference and planning document that identifies highway improvements to serve the existing and projected population and economic activities. It may address structural or safety problems that warrant major construction or reconstruction. Projects in the HNI only identify a need based on technical analysis and adopted by local and regional transportation plans. Inclusion of a project does not represent a commitment to implementing the project. The HNI is not financially constrained, nor is it based on revenue forecasts.

To allow local governments to input projects into advancing projects from the HNI, during the fall of each year Maryland DOT officials embark on what is known as the annual tour. During the tour, state transportation officials travel to each county in the state to present transportation improvement plans and seek input from local officials (local government officials and state legislators). The input received in each county is used to help assess transportation priorities for advancing projects from the HNI. Then, in mid-November the SHA develops recommendations for inclusion in the Consolidated Transportation Plan. Because the plans are developed one year at a time, the relative funding levels devoted to each program changes very little from year to year.

Why Does Maryland Embrace Asset Management?

The Maryland SHA is in a relatively unique position because of its resides within the Maryland DOT; being an agency under the DOT helps to insulate the SHA from political pressure. For example, the administrators, at least over the last two decades, have been transportation professionals and not political appointees. This does not mean that the SHA does not receive

political pressure to advance projects; it simply means that the SHA seems to be more insulated than its peer agencies in other states. Even though it was not highlighted during our discussion with SHA staff members, the General Assembly's authority to strike projects or programs from an agency's budget without the authority to insert projects or programs appears to be a distinct advantage, when compared to other states, for depoliticized project selection decisions.

The Maryland SHA has made a commitment to developing asset management systems for several categories of assets and to promoting resource allocation decisions based on data that define the impact of decisions made. The SHA has a mature and nationally renowned system for managing the agency's pavements. It is currently working to develop equally robust management systems for other asset categories. Top management within the SHA actively promotes the use of asset management systems and has experienced the value of asset management systems when trying to justify resource allocation decisions to the General Assembly and the state's administration.

Because Maryland is a small state, it is relatively easy for field offices and the central office to collaborate on decision making. The central office's familiarity with field needs and the projects identified in the HNI help ensure that input is received from local and regional governments and that the districts are considered when selecting major projects. The authority given to the districts to direct their own maintenance and preservation programs within budget limits, while maintaining bridge and roadway quality conditions, provides the autonomy needed to direct preservation and maintenance programs based on local information, needs, and conditions. Further, because the districts have a robust preservation project selection tool, the district offices are gaining familiarity and trust with the asset management approach.

The long-term commitment of management, over several different agency leaders, to consistent and data-driven resource allocation seems to be the most important reason why the Maryland SHA is progressing along a path to incorporate asset management in decision making. The current administration leader encourages asset management from above, uses asset management data in decision making and project justification, and provides the financial and human resources needed to implement asset management.

Florida Department of Transportation

The Florida DOT was the largest case study organization, with 7,450 employees and 41,000 lane miles of highways as well as responsibility for many non-highway assets (railroads, ports, transit, etc.). The Florida DOT had a budget in 2007 of about \$7 billion. Federal aid is slightly less than 30 percent of the total DOT budget. Unlike many organizations of its type, the Florida DOT assumes transportation policy leadership for all transportation systems in the state, even those owned by the private sectors and local and regional governments.

Introduction and the Big Picture of change

During the last fifteen years, the Florida DOT has gone through significant transition, and it is still modifying and improving its internal business process. In the late 1980s, the department

experienced significant financial difficulties due to its effort to increase production and decrease the time for delivering transportation projects at a time when the agency's financial systems were not synchronized.

During the early 1990s to the 2000s, the Florida DOT transitioned from an agency that that was unable to deliver projects on schedule to one that reliably delivers one of the country's largest transportation programs year after year. The Florida DOT transitioned from an agency that was incapable of controlling cost growth to one that tightly controls budgets, and from an agency viewed as an unreliable steward of the state transportation system to a reliable steward. During the 1990s and continuing into the 2000s, the agency very deliberately developed systems and processes to better manage the department and controls to manage project delivery and schedules, and its credibility has grown to the point where the legislature and the public view the Florida DOT as a reliable steward of the state's transportation system and a reliable instrument for implementing the policies defined by elected officials.

Over the last fifteen years, the number of miles traveled on the state highway systems has doubled while the number of lane miles has grown less than one percent per year. (*ix*, p. 10) Population in Florida has increased by one-third in the last fifteen years (from twelve million to over seventeen million), which has led to growing congestion in and around the state's urban areas and a growing demand for transportation services. (*x*) Funding for the Florida DOT has also grown quickly. The Florida DOT has grown from about a 2.5 billion dollar budget in fiscal year 1994–95 to about a 7 billion dollar budget in fiscal year 2005–06. Construction contract lettings have grown from under a billion dollars in fiscal year 1994–95 to nearly 3.6 billion dollars in fiscal year 2005–06.

At the same time, the Florida DOT experienced a reduction in force of twenty-seven percent. In August 2000 the governor's Office of Policy and Budget instructed state agencies to examine their operations and develop long-range program plans that would have the effect of reducing their workforces by twenty-five percent over a five-year period. (*xi*) The Florida DOT developed a plan to reduce their work force by twenty-seven percent by 2005–06, and the agency has achieved its objective. Not only has the Florida DOT had to deliver a much larger program, but it did so with a much smaller staff. This has lead to closer relationships with the private sector (e.g., professional services firms, service contractors, and construction firms) and a situation in which the private sector has been assigned more and more responsibility for delivering the Florida DOT's program. Increasing the capacity of professional service firms to be able to support the Florida DOT's program has required considerable integration of consultants and service contractors into the DOT's work activities and has changed the culture of the DOT's relationships with its consultants and service contractors. However, although the Florida DOT increasingly relies on construction contractors, the relationship and procurement of construction methods have essentially remained the same.

With over eighty million tourists arriving in Florida every year, mostly by air or automobile, and with a quickly growing population, tremendous demands are placed on Florida's transportation system. (*xii*) At the same time, funding for transportation has continued to increase during this same period, largely due to indexing of the gasoline tax (indexing the tax to increase with inflation). Additionally, during 2005, a discretionary increase in funding was made by the

legislature through an allocation of funds from the state's general fund. The growth in funding has occurred with very few project designations (earmarking) by the legislature. The growth in budgets with very little legislative interference in the department's budget is a source of pride for the employees of the Florida DOT, and they believe it is an indication of the credibility they have for being able to deliver the transportation program reliably.

Florida DOT Perspectives

One of the first strategies that the Florida DOT applied to regain credibility in 1990 was to decentralize authority and provide the districts with a greater share of responsibility for project delivery. Also in 1990, the Florida DOT divided the highway system into two networks of roadways, one of statewide importance (about 4,000 miles of interstate highways and multi-lane arterials) called the Florida Intrastate Highway System (FIHS), and another network that included the rest of the state highways (non-FIHS). The headquarters of the Florida DOT programs improvements and perseveration for the FIHS, while the districts are given resurfacing mileage, a budget, and pavement condition targets but are allowed to program their own projects on the non-FIHS. As an illustration of the division of lines of authority between the central office and the districts, the Office of Work Program (a central office) programs resurfacing projects into the five-year work plan for the FIHS (a maximum of three years in advance) with assistance from the Office of Pavement Management. The Office of Pavement Management identifies projects, and the Office of Work Program establishes the projects that enter the program based on network condition standards, budget, and the specific attributes of the project. Then, once an FIHS resurfacing project is selected, the Office of Pavement Management works with the respective district office to establish a project scope (e.g., the project limits and project engineering parameters), and the project is programmed for execution by the district office. For the non-FIHS state system, each district works with targets it has been given for miles of resurfacing, a budget for resurfacing, the condition of individual pavement sections, and a condition target to develop the district's resurfacing projects to be added to the work program.

Regardless of the highway system, the districts lead the execution of projects. Districts have their own engineering staff, the districts are responsible for contracting for project-level consulting services, and the districts lead their own maintenance and construction contracts. The Florida DOT largely views decentralization of authority as a division in which policy, process, fund management, and program condition monitoring are conducted centrally or with central oversight, while project delivery is largely a district function.

The creation of a statewide highway system of strategic importance is believed to help the agency view the state's transportation needs more systematically and hence remove some of the geographical and asset category barriers from the resource allocation process. Also, in the early 1990s, the Florida DOT conducted long-distance corridor master plans for the freeway system and similar action plans for the arterial portions of the FIHS. These were systematic plans that examined the functionality and performance of the corridor as a system and provided guidance on improvements through time. These master plans and action plans help reinforce system-level thinking rather than focus on individual improvements or individual locations within a corridor.

In the development of a transportation program, there is a great deal of consultation with regional and local governments to synchronize programs and plans and to encourage financial partnerships in project development by private transportation companies and local and regional governmental agencies. At least since its five-year update to the long-range transportation plan in 1995, the Florida DOT has viewed itself as providing policy and guidance for the development of the entire Florida transportation system. This means that the transportation plan provides broad policy direction for all transportation facilities and services in the state, including private facilities (railroads and ports) and the transportation systems operated by local governments. The tie to local and regional governments and the responsibility for the policy of non-highway modes has particularly strengthened the reliance on district offices. The emphasis on the entire transportation system and all modes tends to reinforce system-level thinking and reduces modal or geographic barriers.

The responsibility of the Florida DOT for the state's entire transportation system was further reinforced when the Florida legislature created the Strategic Intermodal System (SIS) in 2003 (more will be discussed about the SIS later). The SIS includes the FIHS, public and private transportation facilities of statewide importance, and intermodal facilities that connect transportation systems of statewide importance. For example, airports, transit systems, ports, and railroad corridors may all be included in the SIS. The SIS also includes local roads that connect facilities (e.g., ports, airports, intermodal rail yards, etc.) within the SIS and to the FIHS. The law creating the SIS allows the Florida DOT to invest in parts of the SIS that are not part of the Florida DOT's highway system to improve system-wide transportation performance and support the state's economic vitality. Although in the past the Florida DOT created a policy for a statewide transportation system, the legislation creating the SIS provides the Florida DOT with stewardship responsibilities and resources for strategic transportation components off the state highway system. Again, the SIS legislation reinforces a system-wide perspective of the transportation system and reduces geographical, modal, or asset category barriers.

Recently, the legislature created the "Pay as You Grow" program. The staff believes that because the Florida DOT has been seen as a reliable steward of the transportation system, the DOT executes its program in support of state policy, and transportation investments are an engine for economic development, the legislature has allocated funds from the state's general fund to the Florida DOT. The first year of funding amounts to a budget increase of a little over one billion dollars starting in fiscal year 2005–06 and a little over one-half billion dollars in following years. With help from DOT staff to craft the program, the new funds were divided into only six programs. The first year includes \$575 million in a one-time transfer of general revenue funds into the Florida Transportation Trust Fund. With the one-time funding, funds are to be deposited into the State Infrastructure Bank and into the County Incentive Program. The one-time money also involves an allocation of \$275 million into a new program, the Transportation Regional Incentive Program (TRIP) and \$175 million invested in the SIS. On a recurring basis, \$541 million in general revenue funding is allocated, to be split among ten percent to new transit starts and five percent to a small county outreach program, with seventy-five percent of the remaining to be allocated to the SIS and twenty-five percent to the TRIP.

The TRIP is a grant program that places priority on proposals for projects that provide matching funds or other sources, which are consistent with local growth management plans and that involve more than one regional entity (for example, two or more metropolitan planning

organizations, or MPOs). The emphasis of TRIP is both to leverage resources and to provide incentives for abutting governments to work together to solve regional transportation problems.

Critical Elements

Over time, the Florida DOT has been implementing and continues to implement management systems and processes to more efficiently manage agency resources. Therefore, it is difficult to tie the Florida DOT's success to any specific actions. Furthermore, because the Florida DOT is currently launching new business controls and management systems, this discussion of the Florida DOT can only be a snapshot of where the agency is currently. For example, the Florida DOT has just developed a project management manual that describes how projects transition from concept to operations. This manual is an important addition to the Florida DOT management strategies because it should lead to standardizing the project development process, making the entire process more transparent to individual offices or individuals in the project development process and allowing for process improvement. By understanding how individual actions interact within the project development process, the project development process develops more disciplined interaction between individuals and offices. Understanding the interaction between steps even helps reduce the entire schedule by allowing individual processes to run parallel with other processes.

The project development manual is only now being released, and, although it has great potential, it is unclear how the manual will impact the project delivery process in the future. The most important trends for the Florida DOT that support overall performance and transcend resource allocation-based on asset categories or geographical boundaries are divided into five categories: 1) A focus on business processes and process improvement; 2) clear and unambiguous requirements for system conditions and performance minimums that directly identify budget priorities which transcend geographical and asset categories boundaries; 3) a specific chain of planning documents that are flexible to respond to current conditions, but that are interconnected by consistent policy; 4) consistent leadership direction; and 5) an open and transparent resource allocation system driven by condition and performance data. (*xiii*)

Focus on business process

In general, Florida has a very top-down view of strategic and business planning. The Florida Transportation Plan (FTP, long-range transportation plan) is the strategic plan and business plan for the organization. Guidance and policy direction flows from the State Strategic Plan, which identifies statewide goals and policies to be supported by the Florida DOT and other state agencies (*xiv*). The Florida DOT also links the governor's priorities to transportation goals and strategies. Although the vision is for a top-down, policy-driven plan, the conversion of state-level priorities into short-term objectives is fairly flexible, and the mapping down from broad, state-wide priorities (e.g., strengthening families) to transportation strategies requires contextual interpretation. However, the focus on high-level policies rather than on specific transportation deficiencies or needs promotes the achievement of overall agency objectives when allocating resources, as opposed to meeting geographical or asset category objectives.

Some of the most important management strategies used by the Florida DOT to improve the operating efficiency of the organization include the following:

Performance Measurement. In 1990, the Florida DOT was an early adopter of performance measures. During the 1990s the Florida DOT strengthened its management control, first through a better understanding of the conditions of its infrastructure by implementing pavement, bridge, and maintenance management rating systems. Then, in 1993 the Florida DOT developed a program and resource plan that documents all performance measures used to make programming decisions.

The performance measures collected by the Florida DOT evolved over the 1990s. Performance measures are tied to the agency's mission and the goals of the long-range transportation plan. Because the mission and long-range goals tend to be relatively intangible (e.g., safe transportation), they are then supported by more tangible long-term objectives (e.g., reduce the rate of motor vehicle crashes, fatalities, and injuries and bicycle and pedestrian fatalities and injuries on highways), which can then be carried into strategies through short-term plans and performance measures. Hence, performance measures are created and used to support the tracking of progress for policy objectives. Since there are necessarily a large number of objectives (both short- and long-term), there are a large number of individual measures. To gain a comprehensive view of the agency's performance, management boiled down performance to key indexes (composites of individual measures) or key performance measures (KPMs) in 1999. The Florida DOT initially had nineteen KPMs, but it currently has eleven KPMs, and management expects to reduce KPMs to five (xv, p. 25). The agency's KPMs are often called "dashboard" measures. KPMs are scorecards for the alignment of goals and objectives, and the agency manages operations with a scorecard or "dashboard" measures. ("Dashboard" measures are intended to indicate short-term performance, like the gas or oil light indicators on the dashboard of a car.) The current KPMs listed below are composites of individual measures but indicate performance in each of the categories listed below:

1. External customer satisfaction
2. Customer complaints
3. Employee satisfaction
4. System safety
5. System condition
6. Alternative travel choices
7. System performance
8. Construction project time changes
9. Construction project cost changes
10. Delivery of the work program
11. Organizational effectiveness

The Sterling Council Challenge. The state of Florida developed the Sterling Council in 1992 to improve the performance and management of Florida private and public organizations. (xvi) The Sterling Council is a public/private not-for-profit organization supported out of Florida's executive office. The Sterling Council reviews organizations (private and public) based on the Sterling Criteria for Organizational Performance Excellence and the Malcolm Baldrige

National Criteria for Performance Excellence. The Florida DOT then began organizing around the seven Sterling Quality Criteria: 1) leadership, 2) strategic planning, 3) customer and market focus, 4) information and analysis, 5) human resource development and management, 6) process management, and 7) business results. These criteria continue to be organizing criteria for business planning by the Florida DOT. Activities in the agency's business plan (business model), objectives, performance measures, and performance targets are organized around the seven Sterling Quality Criteria.

In 1997, the department took its first step in the Sterling award process. The first step is a self-evaluation, the Sterling Navigator, and in 1997 the Florida DOT conducted the formal process of a self-evaluation. In 1998, the Florida DOT conducted the next step and took the Sterling Quality Challenge and received a Sterling feedback report providing broad guidance to the department's opportunities for improvement (*xvii*).

Fostering the Development of a Strong Outsourcing Industry. In fiscal year 2003–04, the Florida DOT spent \$705 million on consulting services. This is believed to be one of the largest professional services programs of any state transportation agency in the country. A recent estimate put consultant-delivered project designs at eighty-two percent, and consultants conducted seventy-five percent of the transportation planning. The Florida DOT also has contractors perform eighty percent of its maintenance work through performance-based “asset management” contracts. The Florida DOT's involvement of the private sector and outsourcing allowed the agency to increase its project-delivered volume while reducing its internal forces by twenty-seven percent.

Physical Services Contracting. The Florida DOT, along with a few other states (notably Virginia and the District of Columbia), are known for being leaders in the use of asset management, system-based maintenance service contracts. An important characteristic of these contracts is that the maintenance of all assets located in the right-of-way for an entire geographical area (e.g., a county or group of counties) is outsourced to a private organization for a long-term period (from six to ten years), specific performance requirements for the contractor are identified, and payments are made through fixed lump sums (*xviii*). Maintenance contractors are selected based on competitive proposals in which sixty percent of the selections are based on the technical merit of the proposal, and forty percent are based on price, as compared to the more typical selection in which price is heavily weighted. Through asset management-based maintenance contracts, the Florida DOT benefits from price and program stability, fewer contracts to administer, fewer administrative staff and resources, and demonstrable performance results.

Professional Services Contracting. The Florida DOT's success in accomplishing growth in the number of consultant-delivered projects has resulted both in streamlined processes for consultant selection and actively the fostering of a financially healthy professional services industry. The Florida DOT's project-level consultant selection process is centrally administered, but consultants for projects delivered by a district office are selected by the district office. Local selection (through the district office) promotes local relationships between consultants and project managers. The Florida DOT's consultant selection process is a national model based on its fairness and minimization of the barrier for developing a task order or agreement for services.

All consultants wishing to work for the Florida DOT must be qualified technically to conduct work in various technical areas and qualified by varying levels of complexity (measured by contract size, where larger projects are considered more complex). For contracts over \$250,000, the consultant must also be administratively qualified (have appropriate accounting and labor tracking systems).

When the Florida DOT solicits for consulting services, it circulates a two-page letter of interest from pre-qualified consultants interested in the project. Based on the two-page letter, a technical review committee selects the top ten firms based on technical merit. Then the selection committee, consisting of top management personnel, selects a minimum of three firms to receive a request for proposal (RFP). The selected firms then provide a proposal orally or in writing, the technical review committee ranks the firms, and the selection committee considers scoring and other factors (availability of staff, firm capacity, past track record on projects, etc.) to select a firm to complete the project. Winnowing down the number of firms to be considered for a project before releasing an RFP greatly reduces the burden on the department when evaluating proposals and on the consultants when proposing. The Florida DOT has developed a classification for General Engineering Consultants (GEC), in which the consultant's employees can serve as staff to the department or take on special assignments through a task order. GEC relationships allow the department to select consultants to conduct routine and ongoing assignments, as opposed to project-oriented assignments, and in certain situations consultants can be tasked with an assignment quickly.

Departmental Business Model. Over the last fifteen years, the Florida DOT has focused on having integrated and consistent management plans and on the execution of plans. Policy direction flows down from the agency mission to the long-range plan (the Florida Transportation Plan) to short-range component plans. The business model approach to business planning is to have the same policies flow down to all parts of the organization. Thus, the business plan for the entire organization is the Florida Transportation Plan, and short-range plans are developed to support the long-range policy direction. The agency-wide plan is considered the first tier business plan. The next tier is the development of department-wide functions that cross both the district and headquarters, such as planning, design, consultant management, materials, safety, etc. Each business plan requires that the plan is consistent with the plan for the tier above and that each Sterling Council Criteria area (leadership, strategic planning, customer and market focus, etc.) is addressed and includes an objective (usually from the tier above), activities in support of the objective, performance measures, progress targets, current status, and a person or persons responsible for achieving the objective.

Tier three involves the creation of business plans for individual offices within the functional offices. For example, the tier 2 business plan for Materials (the agency-wide functional level) is supported by a tier 3 business plan from each of the materials offices in the districts and the materials office in headquarters. The tier 4 business plan is developed for groups or teams organized below the office level, and tier 5 business plans are for the individual employee. All tier 2 and 3 plans have been completed.

On an annual basis, the Florida State Transportation Trust Fund (STTF) is generated one-third from federal sources and two-thirds from state sources (gas tax, bonds, tolls, and general fund

revenue appropriated from the legislature). Statutory requirements for distribution of funding help to make funding priorities clear. Florida statutes identify a clear priority for preservation over improvement. The state law requires that sufficient funds for highway preservation be taken “off the top” before funds are eligible for distribution to other programs. First, the Florida DOT must determine what is required to preserve pavement and bridges and to support routine maintenance. Florida statutes set very specific requirements for pavement, bridge, and maintenance conditions (*xix*). The specific condition requirements are to have eighty percent of the highway system’s pavement not deficient based on an annual pavement condition survey, to have ninety percent of the bridges not deficient based on a semiannual bridge inspections, and one hundred percent of the system not deficient based on a maintenance rating system. These statutory requirements help to provide fund-distribution focus and result in a reliable process of allocating resources.

A minimum of fifteen percent of the state transportation revenues must be set aside for transit operations. Once all statutory and policy requirements for transit funding and maintenance and preservation are subtracted from the funds available, the administrative and program support expenses are subtracted, and the remainder of the budget is available for improvement programs. This distribution of funding has resulted in a little less than half of the STTF going toward system improvement. The improvement programs are programmed over a five-year period; hence, changes to the improvement program budget (discretionary funding) must be made incrementally as new funding (above levels defined in the work program) become available. Florida statute identifies the first three years of the adopted five-year work program as a commitment by the legislature to undertake the projects identified; therefore, little flexibility exists to shift or adjust the budget in the short term.

Florida statutes require that fifty percent of discretionary funding be spent on the FIHS (now part of the SIS). The Florida DOT’s internal policy is to increase the portion of the improvement funds invested in the SIS incrementally to 75 percent. The non-SIS improvement funds are programmed through districts for improvements within the district.

On top of the other legislative requirements is the requirement that funding from the STTF must be returned to the districts based equally on the population of the district and on the amount of motor fuel taxes collected within the district. Furthermore, several other special programs focus on economic development (for small-population counties), grant programs to incentivize local investment in state highway improvements, and other programs that have their own distribution requirements. Staff estimated that there are roughly two hundred different sources of state funding, all of which have some distribution requirement. However, staff did not feel that any of these statutory distribution requirements are so confining that they result in misallocation of resources. Instead, the requirements provide the agency with a clear priority for funding preservation first and allow the agency to make technical decisions on project priorities within the policy framework.

As noted by Pagano et al., the highly statutorily-defined nature of the program caused the Florida model to evolve into an extremely reliable resource tool. (*xiv*, pp. 137–138) The structure of the system lends itself to creating an atmosphere of reliability and discipline. The new “Pay as You

Grow” funding creates new funding that can be used to adjust budget priorities, but without new funding in the budgeting process there is very little flexibility.

Policy-Driven Integrated Planning Process

The Florida DOT has a top-down integrated planning process, illustrated in Figure 2. Objectives of the state comprehensive plan are linked to the Florida Transportation Plan (long-range plan). The agency’s mission is linked to its long-term goals, and long-range objectives flow from the goals. The FTP is to be updated every five years and covers a twenty-year period. The Short-Range Component is an annual report that documents the strategic goals, short-range objectives, and strategies necessary for the department to work with its partners to implement the long-range goals and objectives of the FTP. It also serves as the department’s annual performance report.

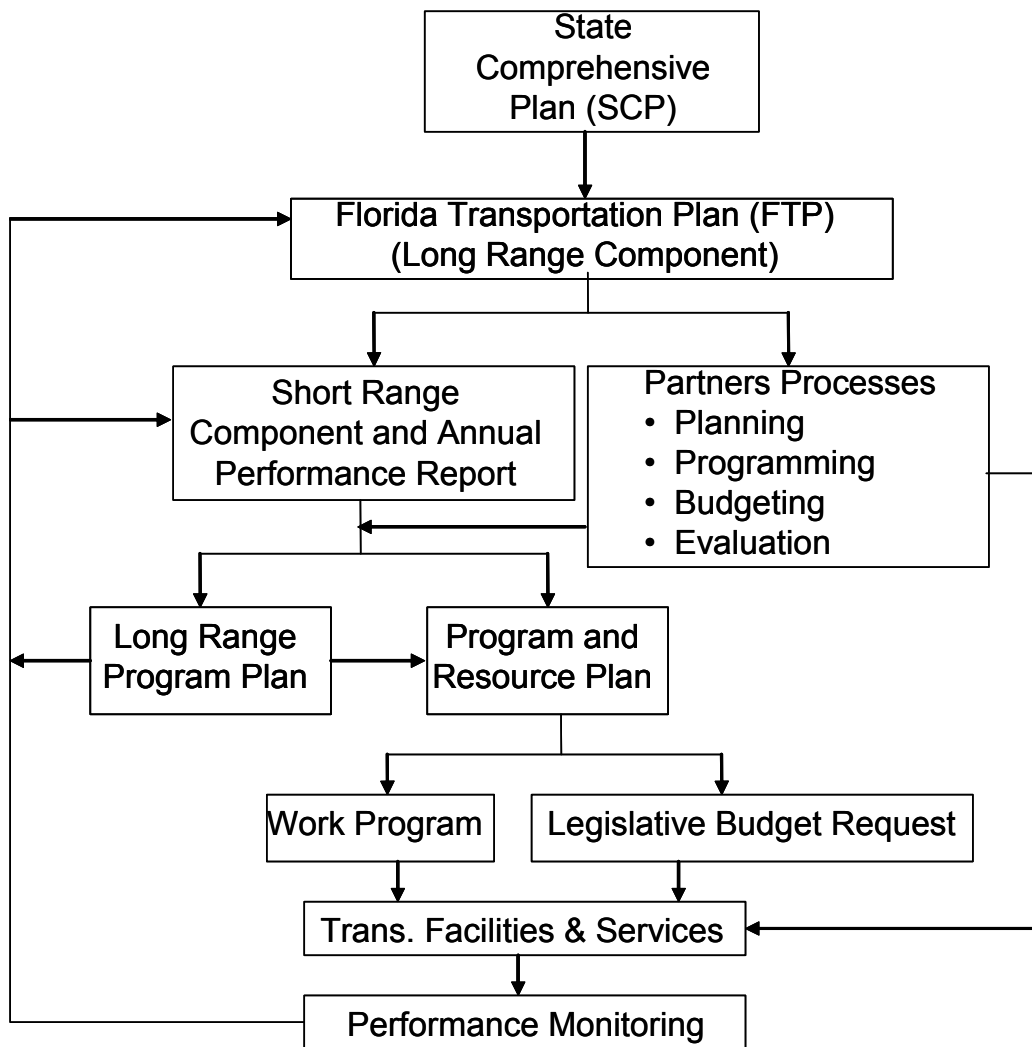


Figure 2. Florida's transportation planning process (xx)

The Program and Resource Plan is a ten-year plan that, by establishing financial and production targets for state transportation programs, guides program and funding decisions to carry out the goals and objectives of both the FTP and the Short-Range Component. The Long-Range Program Plan is a five-year plan developed by each state agency to achieve state goals, agency program objectives, and the service outcomes from those programs. It provides the framework for developing agency budget requests and related performance measures. The Work Program is a five-year listing of all transportation projects planned for each fiscal year by the department, adjusting for the legislatively approved budget in the first year. The Legislative Budget Request is the annual request to the legislature for amounts of money an agency of state government believes will be needed to perform functions that it is authorized by law to perform. The program is then applied to the transportation system, the performance of the system is monitored, and the results of the performance monitoring provide feedback with respect to the department's ability to achieve the objectives identified in the long- and short-range plans.

The structure of integrated transportation planning and performance monitoring creates a reliable and deliberate structure for delivering a program that reflects the administration's and the legislature's policy direction. Because of the machine-like program delivery of the Florida DOT, the state used the DOT as an economic recovery engine in the wake of the attack on the World Trade Center and the Pentagon on September 11, 2001. Although the economy was already heading into recession, the attack on September 11 exacerbated the recession. An economic downturn and the general safety concerns about travel resulted in reduced travel and tourism, disproportionately impacting tourism destinations like Florida. (xxi) To provide an economic stimulus, approximately \$600 million in projects was moved from future years into the current annual work program. The Florida DOT was able to accelerate projects without additional resources provided to the department.

Leadership

Because the Florida Transportation Plan provides policy direction for all modes, and the Florida DOT can provide improvement funding to all modes and transportation facilities operated by local governments, special authorities, and by the private sector, the Florida DOT is in a leadership position for transportation within the state. Clearly, this requires integration with the plans of other governmental organizations and operators of airports, terminal facilities, and railroads. This leadership also creates a perspective of the transportation system that transcends typical modal and regional barriers. Furthermore, when interviewed, many of the staff felt that the leadership for the department and the consistent direction of the leadership helped reinforce the business principles developed during the last fifteen years.

From 1989 until 2005, the Florida DOT had three secretaries that rose through the ranks of the department. In other words, all of these secretaries were leading a department that they understood and a department they helped to develop and structure. Their perspective on department management was largely consistent with the existing management direction of the department; furthermore, because all three were career transportation professionals, they understood the Florida transportation enterprise. When leadership changed, the leadership direction remained consistent. The consistency of leadership direction provided continuity, allowing each department to develop its business processes.

In the summer of 2005, Secretary of Transportation Jose Abreu resigned for personal reasons, and the governor appointed a new Secretary of Transportation, Denver Stutler. Although not a DOT employee, Stutler was a member of management in another state agency with similar infrastructure responsibilities, the Florida Department of Environmental Protection, and was an engineering consultant. When interviewed in November 2005, staff believed that Stutler would continue to improve on the business and management systems in place, thus providing continued continuity.

Transparent Resource Allocation Process and Program Development

Resource allocation, program development, and department performance monitoring are overseen by the department's executive board and supported by the executive committee. The Secretary of Transportation chairs the executive board, whose members include the three assistant secretaries of Transportation over Engineering and Operations, Finance and Administration, and Intermodal System Development; the district secretaries (equivalent to district engineers); and the director of the Turnpike Enterprise. The Executive Committee consists of headquarters office managers, and the Executive Committee supports the decision making of the Executive Board. The Executive Board meets monthly, holding meetings open to visitors and employees, and meeting topics and minutes are made available through the Internet.

During the spring of the each year, 22 functional area managers (Materials, Design, Right-of-Way, etc.) work with the Office of Financial Management to develop their program for the upcoming year of the five-year work plan. The plan is then compared with condition trends, prior funding levels, and projected conditions. The annual budget is packaged into five categories: 1) construction and improvements to state transportation, including preservation (in Florida's terminology, these are products); 2) product delivery services (design, planning, environmental studies, etc.); 3) operations and maintenance; 4) administration; and 5) other expenditures not easily classified. Once the annual element of the program for all functional areas has been examined and adjusted, it goes to the Executive Board. The Executive Board reviews each functional area to examine condition trends, performance, and needs with the functional manager and with representatives from the Office of Financial Management.

Other projects or programs may also be brought to the Executive Board for potential funding. The Office of Financial Management is responsible for adjusting the budget of requests so that they fit into the entire budget and for working with functional managers to ensure that requests are adequately document- and data-driven. For example, the Office of Safety has typically asked for more funding from year to year for hazard elimination and safety improvements yet was routinely denied because its requests were not tied to specific outcomes. In 2003, the Office of Safety developed a Statewide Comprehensive Strategic Highway Safety Plan that outlined the costs of safety improvements and the likely outcomes of investments. Because the Office of Safety had a plan with specific costs and benefits, the Executive Board allocated funds to begin implementing the comprehensive highway safety plan. Once the budget for the next year is approved by the Executive Board, it then goes to the Legislature for approval in July.

The legislature usually does not get involved in individual budget items or the insertion of projects into programs. Florida statutes require that for any funding identified by the legislature

for a specific project, an equal amount of funding be reduced from the district budget covering the same geographical region. Therefore, the number of projects designated by the legislature has decreased over time.

Conclusions

Although each of the DOT agencies interviewed stressed the flexibility the agency had to allocate funding, each received a fairly stable source of funding for different asset categories based on state statute, performance requirement, sufficiency of historical levels, or budgeting by category before balancing between silos occurred. All three states had common characteristics, the most important of which include:

1. A common reliance on performance measures to help derive an efficient allocation of resources. In some cases the performance measures were composites of several individual performance indices and which made it difficult to determine the exact relationship between measures and specific performance, performance measures were often used alongside exacting measures offered by asset management systems. In some cases, allocations were still tied to road-use parameters such as lane mile travel within a district or fuel tax generated.
2. Similar top-down policy and programming guidance but which also allowed decentralized districts to direct the specific of programs. For example, in Florida the central office directed projects on the transportation system of statewide significance but only gave districts a budget and performance goals for the rest of systems within their geographical region.
3. Fairly long-term leadership that crossed over the terms of governors. In all cases, top management were career transportation employees. This longevity and understanding of transportation issues by top management, we believe, is very important to good asset management. That is not to say that someone from another industry couldn't become a good transportation asset manager; it is just more likely that career employees will make more consistent decisions and rely more heavily on time-tested processes and procedures.
4. Minimal emphasis on analytical tools for asset management. Although the researchers would like to believe that strong analytical tools for managing assets were important, only one of the three agencies (Maryland) seemed concern about having state-of-the-art decision support systems. One of the three agencies had considered investing a state-of-the-art pavement system and decided not to take this step forward.

CHAPTER 4: REGIONAL AND LOCAL GOVERNMENTS

Introduction

The division of resources by silos should be antithetical to local and regional governments. The entire purpose of regional governments is to promote geographical cooperation among member agencies and to coordinate the regional transportation funding package to maximize benefits to the region. Regional governments very seldom do any design or development themselves but rather influence the development through operating agencies at the state, county, and city level. Regarding local governments, although the state or federal funding passing through the state may cause some misallocation of resources, local governments are largely governed by a single elected board, and improvements are largely selected through a single programming unit. The majority of infrastructure funding comes from local sources (e.g. property tax, fees, and local option sale tax) making it less advantageous to allocate resources to one portion of the infrastructure at the cost of another. Of course, local managers may have biases that create misallocation (e.g., placing street maintenance above waste water removal and drainage system maintenance). Nevertheless, the ability to build silos within local governments is greatly diminished.

To see if we were correct that local and regional governments natural bridge functional silos, we conducted an extensive interview with one of the largest and most sophisticated MPOs and regional council governments in the Midwest, the Mid-American Regional Council (MARC), located in the Kansas City metropolitan area. As we suspected, based on discussions with MARC managers, we discovered that silo thinking was antithetical to the business of regional governments.

MARC Case Study

On the afternoon of November 3, 2005, researchers spent several hours with Ron Achelpohl, assistant director of Transportation, Mell Henderson, director of Transportation, and David Warm, executive director of MARC. The following is an editorialized discussion of our interview.

How is the MPO organized, what is its role, and what is its authority?

MARC was created by local governments in the regions in the early 70s, predating the federal requirement of having an MPO. MARC is the association of city and county governments and the metropolitan planning organization for the bi-state Kansas City region.

As a voluntary association, MARC fosters better understanding and cooperation on issues that extend beyond the jurisdiction of a single city, county or state. These issues include transportation, child care, aging, emergency services, public safety and 911, environmental issues, etc.

MARC's board of directors consists of 32 locally elected leaders representing the eight counties and 116 cities in the bi-state metropolitan Kansas City region.

MARC plays an active leadership role in strengthening the metropolitan community by providing:

- a forum for addressing regional objectives and diverse community issues;
- long-range planning and public policy coordination;
- technical assistance and services to enhance the effectiveness of local government.

What agencies/individuals participate as policy-level council or boards?

MARC's board of directors is the final point of decision for the agency, but the board is advised by many committees and sub-committees. The principle transportation policy committee is the Total Transportation Policy Committee (TTPC). The TTPC is supported by various modal technical committees, including the Aviation Committee, the Bicycle-Pedestrian Advisory Committee, the Highway Committee, the Goods Movement Committee, and the Transit Committee. These committees generally consist of a mixture of elected and appointed officials and staff members who represent interests of that specific mode. The TTPC advises the MPO Board of Directors on transportation issues and is the policy board for the MPO. The TTPC serves as the local decision-making and policy-development body related to multi-modal transportation in the region. It also operates as a forum for state and federal officials to communicate with local officials and representatives, as well as for citizens and members of the business community to address local officials about transportation-related issues.

Also advising the TTPC are special interest committees. For example, a transportation safety committee has evolved under direction from the TTPC to include more safety-oriented planning in the long range transportation plan. The transportation safety committee has evolved through funding from the Missouri Department of Transportation (DOT) to include safety advocacy which has generated some safety funds for the MPO. The funds are principally safety enforcement and education activities but could be related to any endeavor that is safety-related.

Several other committees have also evolved to provide direction on programming issues. For example, the Congestion Mitigation/Air Quality (CMAQ) Committee provides direction on the programming of federal CMAQ funds, and committees provide priorities of federal fund programming on bridges in Kansas and Missouri. A complete list of committees is included below:

- Total Transportation Policy Committee (TTPC)
- Transportation Legislative Advocacy Committee (TLAC)
- Air Quality Forum
- Aviation Committee
- Bicycle-Pedestrian Advisory Committee (BPAC)
- Congestion Mitigation/Air Quality (CMAQ)
- Goods Movement Committee

- Highway Committee
- Long Range Transportation Plan Sub-Committee (LRTPSC)
- Kansas Transportation Enhancements Committee (TE)
- Missouri Transportation Enhancements Committee (TE)
- Operation Green Light Committees (OGL)
- Special Transportation-Job Access Partnership
- Kansas STP/Bridge Priorities Committee
- Missouri STP/Bridge Priorities Committee
- River Crossing Task Force
- Transit Committee

Collaboration with partner governments: How well do they follow the plans of the MPO?

MPOs at the state level:

The state of Missouri has done a good job of ensuring that their long-range plan objectives correspond to the long-range planning objectives of the MPOs. There is a great deal of coordination between the plans of the MPO and the Missouri DOT. For example, many of the projects identified in the MPO plan on the state system often originate from state-sponsored corridor studies or identified needs. On the other hand, the MPO may first identify needs on the state highway system that the Missouri DOT will then include as an identified need but not necessarily as a priority for improvement on their system. Since the MPO plan represents needs identified by both local and state governments, some of the needs identified on the MPO plan for the state system may not necessarily represent the state's own priorities.

The Missouri DOT tends to have a much more programmatic process in which the state tends to follow long-term objectives and rolls new projects into their program in a reutilized fashion. Coordination with the MPO plan tends to be fairly mechanical.

The Kansas DOT tends to have its own independent state program that is generally tied to specific legislative initiatives. For example, Kansas is currently in a ten-year legislative initiative created in 1999 called the "Comprehensive Transportation Plan," which specifically outlines a high-profile project and identifies state-level funding by category and mode. The 1999 plan was preceded by an eight-year plan developed in 1989. Under Kansas's current legislative initiative, there are several categories of project, the key two categories being the system expansion projects and the major modification projects. For the expansion and major modification program, the Kansas DOT solicits projects from stakeholders, including MARC, and these projects are then considered for potential program funding. Through the Kansas DOT's internal process expansion, projects are selected from their program plan. The Kansas DOT is currently reconsidering how input is considered from regional and local governments through an initiative called Partnership Programs.

The Kansas DOT currently has its own long-term financial concerns, for example currently budget levels and legislative programs leave Kansas DOT unsure of whether there any capacity improvement and development project following the end of the ten year program; therefore, the

agency has been reluctant to consider long-term commitments to large multi-year projects. The Kansas DOT has more commonly focused on counties within the state as natural partners for sub-jurisdiction input to the state, and the agency coordinates with the MPO but does not rely on the MPO as a critical building block for input to programming on the state system. The Missouri DOT, on the other hand, relies on the MPO as a critical building block for the programming process to the state system, yet not exclusively.

Missouri and Kansas provide some interesting contrasts. Kansas has only one MPO, which is truly a multi-county MPO, while Missouri has several. The issues related to divisions of funding in Missouri tend to center on silos: rural versus urban and connectivity versus efficiency; while in Kansas funding is driven by a political process that takes place at the beginning of each new legislative transportation initiative. The differences between the two states help to dictate the role the MPO plays in developing the state transportation system in the region.

- MPOs at the local level in planning and development:
There is very little direction that flows down through the regional plan to the local level. The MPO's largest control over local projects is the scoring criteria it uses to allocate federal funds to local projects.

Projects that are purely locally funded, which impact across jurisdictions, are generally evaluated for their impact on entire systems; however, if a local jurisdiction wants a project to move forward and is willing to fund the project, then the project will generally become part of the regional Transportation Improvement Program. In reality, local projects are selected by local government professionals with a great deal of care regarding continuity of projects between jurisdictions. The local project selection does not currently have a real planning context for determining priorities for local projects but should have a common policy level regional plan. For example, local initiatives to design a hierarchical street network should take into account directing traffic between jurisdictions to higher capacity highway facilities.

- MPO resources for conducting asset management and status of any asset management systems:
The first asset that MARC will own has evolved from Operations Green Light. This program involves the cooperation of about twenty jurisdictions regarding improved management of the traffic control system to create greater throughput on signalized arterial streets. MARC will lead the development of traffic signal plans either in cooperation with the local jurisdictions or develop coordination plans for signals. Ultimately, a communications system will tie each of the individual arterial traffic control systems into a single command center where a MARC employee will manage the system and change or adjust the timing plans and make modifications to signal timings to accommodate incidents. MARC will then own the communications from the arterial or local controller to the control center, the control center, and timing plans.

MARC does not have any role in the asset management of conventional assets other than the making of project funding decisions. The MPO would like to have a greater role in determining whether the appropriate amount of effort is being spent on

maintaining assets to reach a desirable balance between maintenance and capital spending.

Currently, through the federal funding resource allocation process, the local jurisdiction has been asked to develop a description of the condition of the assets being improved or reconstructed, but there is no uniformity in these assessments.

How does the MPO make trade-offs between resource allocation for system preservation vs. congestion/operations vs. economic vs. safety?

The MPO views the categorization of federal funds into categories as more of a positive than a negative attribute. This is largely because unless there was a category of funding – for example, Congestion Mitigation/Air Quality (CMAQ) funds – money might not necessarily be spent to achieve the objective of the program. Very infrequently has inflexibility been a problem.

More frequently, a lack of land-use goals imposed on the region by the state has been more of an impediment creating poor decision making for desirable resource allocation decisions. The lack of a state or regional growth and land use policy leaves the MPO without a policy to focus development.

One of the important elements of the Kansas City MPO, which helps it to provide a more important role in the region, is that it has a pro-active freight strategy, which helps to direct decision making. Because of the MPO's involvement in domestic and international goods movement through or within the region, the MPO has become a more important and effective partner in the region.

Silos

For at least two reasons, regional governments do not seem to have difficulty with resource allocation across asset categories: 1) They typically do not own assets or are limited to special assets (e.g. transit line or traffic management system), so that if a barrier lies between different categories of assets, it is generally at the state level; and 2) because regional governments typically do not build, construct, or operate infrastructure, they do not have silos.

Of course, every agency is different, and responsibilities and revenue received by different regional governments vary. In general, silos are antithetical to the objectives of a regional government.

Additional Sources of Information

Mid-America Regional Council Internet Site, <http://www.marc.org/>

Archives of the Topeka Capital Journal, Newspaper, <http://www.cjonline.com/archives/>

CHAPTER 5: WORKSHOP DISCUSSION AASHTO 2005 ANNUAL MEETING

Purpose of Peer Exchange

State Transportation Agencies (STAs) are organized around “functional silos” for good reasons, but good transportation asset management practices require that barriers between functional and geographical silos be transparent when making resource allocation decisions. The question, therefore, becomes, how can STAs use their functional and geographical silos to optimize agency resource allocation? How can decision makers compare the needs and priorities of one silo versus another? How can communication between silos be fostered to ensure that the large picture is understood and that each silo function is not optimized at the expense of the total system?

This forum was held to discuss opportunities for and experience with bridging silos when making asset allocation decisions. Collaborating with the American Association of State Highway and Transportation Officials’ (AASHTO’s) annual meeting provided a unique setting for STA managers to focus on this critical idea, exchange practices and experiences, and hear some of the preliminary findings of the research project on this topic. Many states sent upper managers including chief engineers, planning directors, an agency director, and deputy directors.

Introduction

Tom Maze started the workshop by making the following introductory points:

Definition of transportation asset management

“The public are all the investors in transportation, and they need to get a return on their investment. And giving them that return is what Asset Management is all about!” (This statement is paraphrased from a public presentation made by Mary Peters, then the FHWA administrator.)

Initial assumptions by the researchers

- We expected that state and federal categories of funding would make trade-offs difficult among dissimilar management systems (e.g. bridge management, pavement management, safety management).
- We expected the quality of systems to be an issue because we heard statements from agencies such as: “We really have a good pavement management system, but we don’t believe we are getting good information for decisions making from our bridge management system.”
- We also expected to find problems with lack of flexibility in funding; problems with inadequate resources; possible problems with the “pay as you go” philosophy; and issues of being over-committed, such as for geographic-related economic development (one

state said it did not want to participate because its legislature had gone from being neutral about geographic entitlements to being very positive about them).

- We expected a lack of common knowledge among disciplines (e.g., planning, design and other areas); and concern with a reward system that would reward certain objectives, such as bridge quality or bridge health, which would result in rewarding sub-optimization rather than optimization of the system and organization.
- We expected that top-level management turnover and “flavor-of-the-day” goals for certain parts of the infrastructure might be an issue.

These were most of the things we anticipated finding and asked the workshop attendees to discuss these issues.

What we found through the workshop was quite different. We found surprises that agencies had other issues that were more of concern for resources allocation such as the uncertainty of future funding levels making it difficult to make effective long-term decisions. Barriers created by federal requirements or state requirements that specific funds are spent on specific types of infrastructure (bridges versus roadways) or activity (maintenance versus construction) was not an issue, at least not as great as we had anticipated. A general observation from the phone interviews was that some states were doing some things very well, but no state was doing everything very well (these are the states’ own assessments).

One thing we found was that the agencies without problems with silos operate with open and transparent processes for what they do. They also generally have system preservation as their number one resource allocation priority, and others investments occur after preservation goals have been addressed. Agencies ranked as not having silos, or best able to bridge them, do not necessarily have the most comprehensive or best-integrated GIS or pavement management or other systems, but do have good, open and coordinated data systems. And they do a good job of managing public performance expectations, performance measures and accountability.

Discussion Agenda

While the preliminary discussion guide for this peer exchange was a structured outline, circulated in advance of the workshop, the discussion tended to be free flowing and discussion of topics tended to overlap. To reduce confusion, we have organized our discussion of the meeting in the following order. First are the discussion points and the researchers’ discussion. During the meeting each discussion point was introduced, but in the heat of open discussion, the discussion tended to flow to other related topics. Presented in appendix A is the verbatim write-up of the discussion. Appendix B contains a list of attendees.

The ordering of our text is out-of-sync with the actual order of the way things occurred in real time. Of course, the meeting first occurred and was recorded, then the meeting notes and recordings were transcribed, and then the researchers developed a list of the most important findings. Although the transcription is organized to be self-explanatory, we assumed that it is too detailed for most readers and that most readers are interested in the condensed summary included in the researcher’s conclusions.

Discussion Points

1. To what extent do eligibility and management requirements for the use of federal funds create a barrier for resource allocation, such as:
 - a. federal requirements for funds distribution by program, including bridge program, safety, 3R/4R safety standards, interstate maintenance, Congestion Mitigation/Air Quality (CMAQ), National Highway System (NHS), etc.?
 - b. federal requirements for collaborative planning with local officials and regional planning organizations?
 - c. federal requirements allocating funding based on geography (MPO, TMA, or areas of less than a 5,000 population)?
2. To what extent do state and local requirements or influences act as a barrier to efficient allocation of resources, such as:
 - a. legislatively defined distribution formulas based on geography or other factors?
 - b. legislative project selection?
 - c. legislatively defined programs such as funding dedicated to economic development-oriented projects/programs or funding dedicated to an asset category (e.g., bridges, safety, capacity expansion)?
3. The allocation of resources across functional areas is hard work. To what extent does a lack of resources create a barrier to resource allocation, such as:
 - a. either enough human resources or human resources with the correct skill sets/levels?
 - b. either access to management systems (e.g., pavement management systems, safety management system, congestion management systems) or sufficiently sophisticated management systems?
 - c. access to sufficient asset condition and performance data and appropriate forecasts (e.g., traffic level of service, pavement roughness, maintenance costs, capital costs)?
4. To what extent does a pay-as-you-go philosophy act as a barrier to efficient resource allocation, including insufficient funding stream flexibility to fund needed large capital projects?
5. To what extent does the use of bonding act as a barrier to efficient resource allocation, such as requirements that funding financed through bonding must be used for particular projects or project types, possibly including things which might not have otherwise been selected?
6. Preliminarily, we have observed that agencies which seem to have the fewest barriers in allocating resources between silos have the attributes listed below. To what extent does this agree with your experience? What other attributes should be added?

- a. An internally open and transparent process for allocating resources that is nurtured and supported at the highest levels of management.
 - b. A prioritization for resource allocation that makes system preservation the first priority before programming for any new capital projects.
 - c. Ready access to appropriate data/integrated databases needed to support asset appraisal.
 - d. An agreed upon and publicly accountable set of relevant performance expectations.
7. What organizational/institutional/program management steps, growth or migration, if any at all, have individual agencies taken to further aid development of an integrated asset management process?
 8. How have agencies worked to optimize resource allocation to projects across classes of assets, rather than within classes of assets?

Discussion of Meeting Content and Researchers' Conclusions

The write-up of the results is organized into two parts. The first part is a summary listed below. The second part is listed in appendix B and provides an almost-verbatim list of the discussion. The discussion was interesting and insightful but full of extemporaneous comments that need interpreted. Instead we have summarized our interpretation of the comments. These are listed below.

Do Federal Funding Categories Create a Barrier to Efficient Resource Allocation?

There are too many federal funding categories and requirements not linked to strategic goals at the federal or state level. One example cited for linking funding to strategic goals was the requirement in SAFETEA-LU, which states that each state have a strategic highway safety plan which focuses the state's use of safety funds flowing from SAFETEA-LU legislation.

Because there are generally too few federal funds in all the categories, flexibility is not seen as a significant issue as it could be. Lack of flexibility may become a problem in the future, as higher percentages of available state funds are required for system preservation of the existing system, leaving less flexibility to match federal funds across all funding categories. Requirements for administering each type of funding are difficult. However, more flexibility in federal funding, or reducing federal funding to only one or a few simple categories, would be useful. Some concern was expressed regarding having to match earmarks, which may create a resource allocation that is counter to asset management principles.

In summary, dividing funding into categories creates a more complex issue for states that receive a larger portion from the FHWA than from state resources. However, in all cases each state seems to work within the system. Some states even mentioned that without federal incentives they might not spend as many resources or even neglect items such as enhancements. Although all states agreed that fewer or no categories for federal funds would be preferable to the current system, none saw it as an unacceptable barrier at this point in time.

Federal Data Collection Requirements, Re-engineering Legacy Data Requirements to Support Current Data Needs

Federal programs have several data collection requirements. These requirements need to be reviewed to determine if the benefits of data collection are worth the expense. Technology, agency objectives and other important attributes has changed in the last twenty to thirty years, but the data collection requirements have not changed with the times. These data requirements need to be investigated to determine how to best synchronize the data needs of the state for state-level decision-making with federal data requirements.

Funding and Financially Sustaining State Transportation Systems

The ability to finance transportation through tolls was discussed. Tolls and toll credits to match federal funds provide an opportunity to finance transportation services and facilities. Generally, requiring the linkage of tolls to only new capital projects and capital costs does not recognize the operating, maintenance, and preservation costs associated with interstate highways. Rural states that do not need capacity improvements may, therefore, lack the ability to use tolls to finance facilities. More urban states are going to look for mechanisms to fund new capacity through toll financing. In general, however, it was felt that more flexibility in tolling is required to create opportunities for funding to sustain transportation services and facilities. In general, it was recommended that the congress and the administration, with the advice of state governments, should develop more flexible tolling opportunities for existing and reconstructed facilities to make tolling a more viable option for system preservation and reconstruction.

Mismatch of Infrastructure and Political Planning Horizons

Asset management and infrastructure planning and development take many years, while the time periods available to politicians to accomplish their agenda generally only last a few years. Asset management systems can help transportation agencies illustrate what the likely outcomes are of investment scenarios, allowing politicians to understand the implications of their funding decisions. But it takes a savvy politician to understand the technical issues involved. Term limits and election cycles make it difficult to build the experience necessary to develop the technical understanding of the relationships between investment and condition. Bridging the short-term of political cycles with the long-term requirements for infrastructure investment is a difficult problem for many states, and solutions are few. Some states have had success linking long-term investment with non-partisan issues like economic development and encouraging investment in transportation through a track record of good stewardship.

Evolving from an Asset-by-Asset View of Asset Management to Corridor-Level or Even Network-Level Asset Management

Several agencies spoke about the need to consider improvements and investments on a broader scale than one asset at a time or even one mode at a time. They suggested the need to evolve investment strategies to the corridor level or even the network level. By considering investment at the corridor level, broader social goals, such as economic development, could be part of the investment and asset management decision-making process. This recommendation needs to be

highlighted, since state transportation agencies often make improvements, and particularly safety improvements (e.g., intersection upgrades), incrementally.

What Should the Number One Objective for Resource Allocation Be?

Many states view system preservation as the number one objective for investment decision making, while a few selected transportation safety or transportation operations as their number one objective when prioritizing resources. Preservation of the infrastructure is probably an easier criterion than the others to measure, as most transportation agencies have mature infrastructure management systems and very mature performance measures for infrastructure condition. Operations and safety have less well-defined management system relationships, and, to some extent, are less controllable than infrastructure condition. Therefore, in reality preservation is the easiest to measure and the most easily controlled by the STA.

Infrastructure condition is almost entirely under the control of the Transportation Agency. Whereas safety is under the control of police agencies, local government and many other participates beyond the state transportation agency. However, the group consensus was that all three goals are just the other-sides of the same coin. A safe highway system is one that is in “good condition” (preserved) and “operates efficiently.”

Better and Integrated Asset Management Systems

Although the current state-of-the-art of asset management system is a tremendous advantage over past systems, more incorporation of asset management is needed for the highway development, construction, use, and disposal process. Part of the problem is that systems tend to support existing silos rather than to bridge across silos. Many agencies have successfully bridged silo-based systems by using weighted performance measures for comparisons across silos. Silo-based asset management systems need to integrate across silos to understand the implication of investment in one versus the other. Data-driven information on the implication of funding and an understanding of asset management principles would very much help transportation agencies to work out budgets with legislators or legislative committees.

CHAPTER 6: CONCLUSIONS

As mentioned above, our research was conducted in three stages: 1) by conducting wide-ranging telephone interviews of STAs, 2) by making site visits and case studies, and 3) by conducting a work shop with STA top executives at an ASSHTO annual meeting.

The common theme running through all stages of the project was the lack of discretionary funding available to STAs. One STA had financial difficulties so deep that it was required to use bonding funds to support routine operations. In other cases, STAs with great flexibility in focusing their funds had very little opportunity to redirect funding priorities from historical patterns. Because funding is tight, most STAs allocated resources to underfunded programs along historical lines and lacked flexibility, due to requirements to provide, maintain, and operate their transportation systems (predominately highways) according to statutory requirements or policy makers' expectations. In other words, their flexibility in resource allocation was minimized by a lack of funding to do more in any area than what they already accomplished.

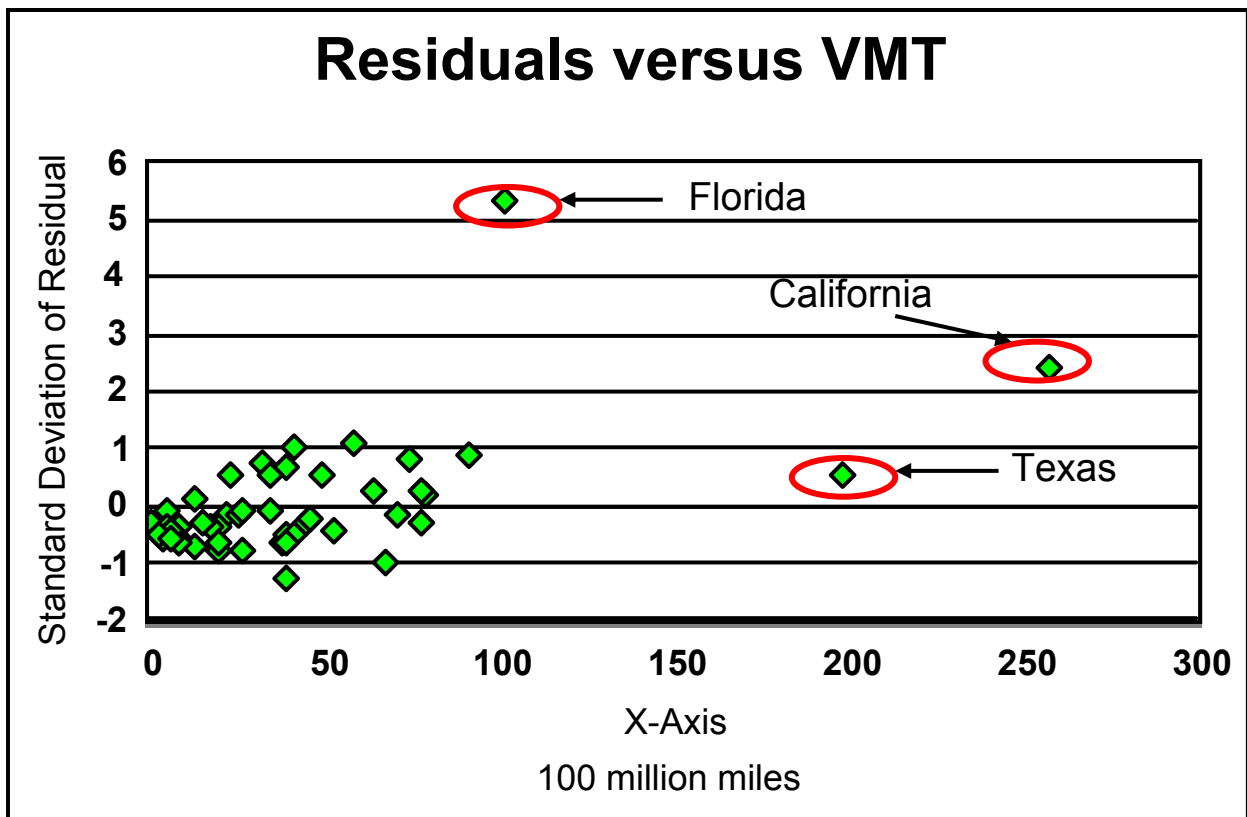
Performance measurement

Performance measures are commonly used to bridge across asset categories when resource allocation decisions. Although performance measurement is an improvement over historical methods of allocating resources based on exceptions or geographic entitlements, performance measurement is only the current state-of-the-art. Performance measures deal with abstract measurement of the condition of assets, making them directly incomparable between asset categories (e.g., the International Roughness Index as a measure of condition for roads and a health index for bridges). Because performance measures only measure condition and not the actual goal of agencies (e.g., promote mobility, promote smart growth, promote economic development), they are likely to be transitory measures as more advanced resource allocation methods are developed and driven by economics instead of by indicators that are believed to be related to user benefits.

As resource allocation migrates to more holistic approaches, it is likely that more widespread comparisons will be possible. For example, Florida over the last fifteen years has focused on business process, project delivery, and program management. This has left Florida with an unbalanced program. Florida has one of the highest traffic crash fatality rates in the country, even through it is one of the best managed agencies of its type in the country. It is seen as a reliable engine for economic development and program delivery, and it has won the support of public policy makers.

To understand how chronic the highway safety problem is in Florida, we took the number of urban and rural miles traveled (in 100 million miles) in each state, from FHWA's "Highway Statistics for 2006" and NHSTA's fatality estimates for 2006, and estimated a simple linear equation (shown below). The equation has an R-squared of 0.89 and all parameter estimates are statistically significant, thus illustrating a reasonably good fit of the model to the data. Figure 3 shows the residuals (the difference between the actual number of fatalities and those estimated

by the equations). If the equation were a perfect fit to the data, there would be no residuals. As can be seen in the graphic, most of the data points (one for each state) are closely grouped around the zero to one standard deviation (+/-) marks. As seen in Figure 3, Florida is over five standard deviations above the mean and clearly has a crash fatality trend that is above other states. Of course, this is a rather naïve analysis and does not count for a multitude of variables related to crashes (e.g., weather, congestion, age of drivers, percentage of drivers wearing seat belts, etc.), and it includes fatal crashes on roadways under the control of local governments. A similar analysis was done for each year from 2000 through 2005; a similar trend was found in each, where Florida's residual was at least three standard deviations above the mean in each year. Regardless of the simplicity of this analysis, Florida's safety record is weak and, in our interviews, staff admitted that this is an area where improvement is needed.



What this fatal crash analysis is intended to show is the need for balance in performance measurement and agency policy focus. Although the Florida DOT's management has focused on business process and project delivery, infrastructure preservation, and transportation's role in economic development, it appears that it has not been proactively measuring and controlling safety performance. In the interviews, staff mentioned that only in the last five years has safety been included as a performance measure, and it will take many years to reverse this trend. This may reflect either the relative immaturity of performance measurement state-of-the-art or performance measurement's inability to measure the true benefits and costs of road users.

Protection from political driven project development

In all the three STA case studies, each agency described an ability to shield itself from project selection driven by the political process. Although all took policy direction from the legislature or other public policy bodies, all had some type of protection from legislatively designated projects. However, in the larger sample of states taken through the telephone interviews, it was found that in nearly half the states the legislature had the ability to direct programming of individual projects. In a couple of states, the legislature selected projects that consumed resources greater than the funding the STA had for projects.

Public policy makers have a role in determining the policy used to select projects, and clearly they have the authority to ensure that policy is being fairly applied in program development and the project selection process. Legislatively designated projects only serve to promote geographic silos and provide an impediment to desirable (optimal) allocation of resources.

Standardization of resource allocation

Uniformity in highway infrastructure is generally identified as a positive attribute of the nation's system. In other words, highways in the North and South, East and West have the same or similar geometry and traffic control. However, the different methods used to manage, finance, and measure performance are unique to each STA. The lack of uniformity is probably a reflection of the lack of guidance and standards and suggests the need for research and development in highway financial management and STA business management. In general, professional organizations, agency associations, and the federal government have been very good at developing technical standards and guidance; even technical guidance for asset management. Unfortunately, these same organizations have not developed guidance on business, financial, and organizational issues. Given the impending financial crises facing most STAs, the FHWA, AASHTO and possible other organizations have the opportunity to add guidance to resources allocation between silos and financial issues such as tolling and other unconventional revenue sources.

Categorization of funding

State and federal categorization was not found to be as great a problem as the researchers expected. A few STAs even felt that categorization of funding was desirable, since it forces STAs to invest in projects that they might not otherwise invest in. This again speaks to the need for guidance in financial management.

Most STAs would prefer to receive federal funds in one category and then allow the STA to allocate funds themselves. It would be preferable to have expenditure processes by STAs monitored by the federal government, rather than forcing funding through categories.

Tolling

A consistent process needs to be developed to allow STAs to use tolls for revenue to finance projects involving new capacity and the maintenance and operating costs of existing major highway facilities. Stifling the ability of agencies to toll on existing or previously free facilities when major improvements are being made only stymies the development process and postpones the inevitable benefits. Therefore, most STAs would welcome the creation of more flexible tolling rules for routine highway development and reconstruction.

Strengthening silos

Silos are a necessary part of the management of STAs. A silo, such as a bridge design office, helps members of the silo to gain expertise through repetitive exposure to bridge design methods, both current and evolving. Silos that can provide accurate and timely asset condition information and information on condition as a result of funding changes improve resource allocation procedures. For example, at the Maryland State Highway Administration, they already had mature asset management systems for their most expensive asset categories (pavements and bridges), and they are working to develop systems for asset categories that consume smaller budgets, thus allowing a level playing field for resource allocation trade-offs. Further, mature and trusted asset management systems allow geographical managers at the district or regional level to make consistent resource-allocation decisions across the state system.

Geographical specialization and decentralization of authority has allowed better decision making at the district or regional level, at least for STAs with large populations or an inventory of expensive urban assets. Decentralization of authority allows specialization in geographic silos.

Sharing of data among the different silos (data integration) enhances the ability to conduct resource allocation trade-offs and allows for more effective management of the infrastructure system.

Long-term transportation professional managers

Although there is no assurance that management with a long-term view of agency policies, goals, and objectives would necessarily result in more consistent and efficient resource allocation, it appears to be an attribute of well-managed STAs. All three of the agencies interviewed have had long-term professional management. When short-term agency leadership turn-over and a lack of professional transportation background amongst STA leaders was discussed in the agency management workshop, many agency managers took turn-over and political appointments as a given that they could do little about but accommodate. However, in general, management selected from the professional ranks and de-politicization of management selection resulted in a more consistent and clearer resource allocation policies and greater dependence on technically driven systems such as asset management.

APPENDIX A: PHONE INTERVIEW QUESTIONS AND OUTLINE

Outline:

1. Project introduction. A brief introduction to what the research project is about. Define what functional silos are and our objective for documenting best practices in bridging the gap between functionally focused units (or silos).
2. Conduct the interview:
 - a. Open-ended question-and-answer session following the outline.
 - b. Depending on the interviewee, we might deviate from the set of questions we have developed.
3. A follow-up call might be necessary.

Questions:

1. General questions: Most of the following questions could be answered by the agency before the phone interview. These questions are intended to identify the type of organization in terms of the following factors:
 - a. Organizational structure (unless we already have an organization chart)
 - b. Would you describe your organization's resource allocation process as centralized or decentralized, and why?
 - c. Is your agency governed through a commission or legislative committee, a strong Chief Administrative Officer (CAO) or other form of leadership? If led by a commission or a legislative committee, then what resource allocation authority does the commission have?
 - d. Size of the system:
 - i. Number of miles of interstate highway maintained
 - ii. Number of miles of non-interstate highway maintained
 - iii. Number of miles of non-interstate highway maintained
 - iv. Number of bridges
 - v. Other major physical assets
 1. Transit vehicle and right-of-way
 2. Freight rail roads
 3. Ocean and inland ports
 4. Airports
 5. Others
 - e. Funding:
 - i. Total budget (all sources)
 - ii. Infrastructure maintenance/preservation budget
 - iii. Capital improvement budget
 - iv. Other major budget categories
 - f. Revenue income characteristics:
 - i. Does your agency bond for capital projects, or does your agency follow a pay-as-you go philosophy? If a pay-as-you go, is this set by policy or by statute?
 - ii. What are the sources of state funding and, are these funds dedicated to transportation? Are they dedicated legislatively or constitutionally?

- iii. What is the financial climate of the state, and have there been any successful efforts to divert transportation funding to other uses?
 - iv. How would you describe the balance between state funding and federal funding provided to your agency?
 - v. Does your agency have authority to toll finance transportation projects? If so, are there restrictions on the use of toll revenues?
 - vi. Are there other sources of revenue?
 - g. Agency-level revenue distribution
 - i. Are there funds that are routinely received from the state dedicated to certain functions, such as funding for bridges, funding for pavement preservation, funding to support economic development, funding to support system expansion, funding devoted to large projects, funding for the interstate system versus primary highways, etc. If so, what entity identifies the amount of funds dedicated to each function (e.g., statute, legislature, commission, policy), and what criteria are used to set resource levels devoted to each function (e.g., needs, number of jobs created)?
 - ii. For the funds that are routinely received from the state sources, are there distribution requirements based on geography or population (e.g., split between urban and rural, split between quadrants of the state, allocated to regions in proportion to population or in proportion to revenue generated)? If so, is the allocation based on statute, determined by the legislature, determined by a commission, based on agency policy, etc.?
 - iii. Does the legislature or the administration ever provide special-purpose funding (one time funding) for special projects or special programs? If so, are the projects funded adequately to complete the project or program? If not, how is the under-funding of state-level special initiatives handled.
 - iv. If your agency answered *yes* to any of the three questions above, then how does your agency integrate these externally driven allocations of resources with infrastructure needs-driven or user demand-driven resource requirements?
2. The following set of questions relates to the different management systems that agencies commonly utilize and how they support resource allocation.
- a. Does the organization have an interest in the topic of asset management; does it have an active program or major elements of a program?
 - i. Does your agency operate an overall asset management system (a master asset management system)? If so, could you briefly describe this system? How is this system used in actual resource allocation?
 - ii. Does your agency operate systems that manage individual categories of assets: (pavement management system, bridge management system, maintenance management, safety management, etc...)? If so is there any effort made to bridge resource allocation among these systems, and how?
 - iii. Does your agency use such economic decision-making tools as Life Cycle Cost Analysis, Benefit – Costs analysis, HERS-ST, etc.? If so, how?
 - iv. In general terms, what is the role of functional units in asset management and resource allocation process? Is the process documented? Are the outcomes formally reported?
 - v. Is the same process used for both state and federal funds?

3. The following set of questions has to deal with resource allocation between and among state sub-areas (e.g., districts, divisions, or regions).
 - a. How do the state sub-areas decide what their financial needs are?
 - b. Assuming that financial needs exceed financial resources, how is resource allocation conducted between state sub-areas?
 - c. How do state sub-areas coordinate between themselves and with the Central Office and other functional offices (e.g., pavements, bridges, safety, design)?
 - d. How are resource allocation plans coordinated with regional governmental agencies (e.g., MPOs and rural regional planning organizations)?
4. The following set of questions deals with the oversight of agency resource allocation decisions.
 - a. Is there a formal process for the state executive, a legislative committee (or legislators), or an external oversight committee to review agency resource allocation and projects/programs and to make resource allocation recommendations?
 - b. Is there an informal process in which the state executive or legislators review agency resource allocation and projects/programs and make resource allocation recommendations?
 - c. If there is external oversight, how are adjustments made? Can you provide examples of how external oversight has resulted in constructive change?
5. The final set of questions discusses the integration of management systems and cross-asset decision-making.
 - a. Does the process integrate resource allocation for capital improvements, system maintenance, and system expansion?
 - b. Do the systems implemented for individual assets integrate their decision-making process?
 - c. Does the agency have cross-function teams to help integrate decision-making? How are those teams formed, utilized, and sustained?
6. What are the agency's best practice examples, i.e., practical applications utilized by the agency for any of its assets?
7. What educational opportunities are provided to staff that deal with asset management issues?

APPENDIX B: TRANSCRIBED COMMENTS, OBSERVATIONS AND DISCUSSION AT THE MEETING

Observations were offered about the number (too many) of federal aid program categories and guidelines within categories, such as sub-allocation requirements. If there were strategic goals established for the federal aid system, it would help greatly. The requirement for adoption of a strategic highway safety plan was cited as an example. Concern was expressed that there are so many categories of funds and eligibility guidelines that it's difficult to plan a program and manage a system.

Sometimes federal programs require the collection of monitoring data for various purposes and not all tied to performance management. As state programs evolve to more performance-based solutions within asset management, the data collection streams should make sense for both purposes, as the states can't afford to collect data anymore, unless it makes sense in analyzing and justifying alternatives. Many states struggle now to provide the required annualized data to FHWA that it needs for various purposes, such as the distribution of program dollars. It is necessary to re-evaluate whether those data are truly necessary in all circumstances, if what was being provided 20 to 25 years ago is still necessary with the costs, constraints, and management needs of today.

Data should be considered as asset in itself, and managing data is important. Data streams need to make sense for performance management. There needs to be some connection between the value of data and the effort involved in collecting the data. It needs to be useful for performance measures for federal programs and state goals for asset management. How do stake holders manage data as an asset? Engineers want engineering data, like the corrosion of a beam, while decision makers who are going to guide investment want to know service implications and return on investment. These are different data and require a different analysis. This need has been hurt by budget cuts.

Federal funding categories are a problem because there isn't really enough money in any of them; although it was generally reported the states had not run into a barrier in which they needed to have money in one pot because there was too much in another. As an example, the off-system bridge funding-required sub-allocation was cited as not being a problem for most states.

An issue in one state was coordinating the state legislature's geographic sub-allocation guidelines and federal geographic sub-allocation guidelines. They use two matrixes as overlays and average it out over several years. Currently they are able to work within those constraints.

The first flexibility most would like to see is programmatic: not the earmarks, just general flexibility within and between categories. The optimum number of federal aid categories was most often said to be one. There are too many now even without the added complication of geographic sub-allocation requirements. To start with, the federal-aid highway program had one category, then two and three and six; now is it thirteen or more?

Several states reported they have more state funds than federal funds, about two to one, and that federal aid matching is not a problem or barrier to the use of federal categorical funds. However, several states also commented that they do have a problem with most federal funding categories' general lack of flexibility. Concern was expressed about not having state money available for match in the future; and with the new bill having so much earmarked money, which means less discretionary money than under the Transportation Equity Act for the Twenty-first Century (TEA-21) because of all the designated work, that reduction is seen as a restriction on asset management itself.

At a recent Northeast Association of State Transportation Officials (NASTO) meeting, there was some discussion by many New England states that earmarks limit discretionary funds to less than the last bill did.

Several states said that using the authorized flexibility is becoming a challenge; i.e., the new act allows using bridge money for maintenance, but preliminary discussions with the FHWA Division office state that it depends for what type of maintenance (e.g., bridge rails, load rating issues). There are goals that conflict with each other; states must meet safety goals and weigh them against goals for infrastructure preservation itself. And states run into the same problem anytime a roadway needs to be maintained, if the states don't have the funds to do it without federal involvement. If states do have their own funds, there is no problem; they just pay for the maintenance with their own money. Some states develop their programs without considering the source of funding and then match the funding against it all the way through. But it seems that federal funding eligibility is too restrictive. However, some states said they were spending a major portion of their state money on debt retirement and lacked this flexibility. They reported a real problem with the definition of interstate maintenance and what federal funds can be used for in that program.

Another state used federal funds for contract maintenance. Some states call it preventative maintenance and improvement; they have been able to use federal funds for preventative maintenance. The ability to work with their local FHWA division administrators is cited as a key. It was reported that a policy memo from King Gee, an FHWA administrator, lays out the policy guidance for using federal funds for preventative maintenance

That is absolutely a key; if states are in good shape with state funding, they have tremendous flexibility, and federal rules don't bother them very much. But as state funds become less available in the future, many expect the federal categories will be very restrictive. Most states said they are currently in good shape to match federal aid funds with state revenue, but several offered that by as soon as 2009 federal aid and match will be as much as eighty to ninety percent of their investment program, which will lead to program problems due to the lack of flexibility in the federal funding program.

The consideration of "toll credits" for match provides some additional flexibility for some states.

Several states expressed frustration with not being able to consider tolls on the interstate system and said that Congress doesn't seem to recognize that the operational cost of the interstate system is more significant than the original construction cost. Thus those states felt that

Congress is not giving them the flexibility to toll existing lanes, and they stated that in a state where they are not building any new capacity, then essentially they don't have the ability to toll at all. These states maintained that a little bit of flexibility regarding tolling would be beneficial to small states, as they don't have any way to generate new revenue.

Other states reported they are considering adding a third lane to rural interstates, although it may be several years out. A number of states may be adding third lanes almost everywhere in the state, and that gives them the opportunity to add a toll. These states said they need tolling the third lane as an option, such as a HOT lane, along with other choices that may be barred today.

Right now, as states get into the planning and design stages for adding lanes, they can't afford not to have tolling as an option. States must invest the study money up front before they get past that point; otherwise it's too late. Because it is a revenue issue everyone is struggling with now, sooner or later it must be dealt with.

A change in the federal guidelines regarding the addition of tolls to existing interstates, such as saying if the added investment of a state, for example, is going to be twenty-five percent of the initial construction cost, it may collect that twenty-five percent by tolling the whole facility. By allowing tolling for incremental investments in interstates, states would then be able to finance these improvements. How to conduct this tolling within the federal guidelines is still in the evolution phase, either before or after the fact of construction. Some states expected this lack of flexibility to be an issue in the future.

While some states reported that they are finding barriers in the federal proscribed process for geographic sub-allocations, (e.g., related to metropolitan areas), most said that required allocations for off-system bridges are not a problem.

Sometimes, when a metropolitan area spans a state border, there has been a local unwillingness to form a joint MPO. The two bodies of government don't share information or support across state lines, and the small MPO, which wouldn't even be one (they are less than a 50,000 population) if it weren't for the city on the other side of the border, is greatly handicapped in meeting its obligations.

One state reported that it gets legislative guidance on where and what funds (federal and state) can be used, and that the legislature even programs projects. In addition, as funds (state and federal) get tighter, such program guidelines become more of a barrier to asset management practices. Another state noted that its legislature sets performance targets, including for mobility and economic development. One said that state issues are more critical than federal issues due to the limited local government role in maintaining much of the major highway system.

Some states reported that identifying projects as "for sale," as part of an effort to gain local funding participation, leads to concern over not getting fair shares and over more legislative earmarking. It was also noted that having some legislative policy guidance can guard against administratively "politicizing" the allocation of resources, i.e., regional distributions simply by "needs."

It was noted that tension generally exists between economic development-based allocations and condition-based allocations.

Short-term legislative leadership was contrasted with the long lead-time needed for plan and program development, and was identified as a challenge for asset management-based explanations in the legislative review process. Several states discussed the need for education of the law makers. One noted that term limits lead to short-term goals for legislators, as contrasted with long-term asset management plans, which create additional tension.

One state said it used to be able to count on experienced legislative leaders, but now with term limits, it's like Government 101 training every year. This state has lost the old champions and others who learned the process. One result is the last state revenue increase was four cents per gallon, which passed by one vote in 1997 and is the only increase in twelve years. The state got it because of its ability to show economic links, and is now showing a rolling five-year plan for where money goes. This plan insulates against project selection by the legislature.

Several states commented that it is easier to deal with the legislature that has a five-year program, but sometimes conflicts can occur. It is important to be data-driven in the programming process. These states noted that asset management looks at twenty years while the legislature typically looks at two years, so the two processes are at odds over objectives and background in guiding investment programs.

Several states said their legislatures set directions for the distribution of bonding funds. One reported on a recent effort to authorize a bond issue. Projects were not identified as part of the initiative and bond issue didn't pass. This year bond issue is going to be reconsidered with a partial list of projects identified, along with performance objectives to guide the rest of the investment program.

One state reported its experience with showing bond-initiative projects distributed throughout the state. Some legislators said there was no need for new funding to do a number of those projects. Another state was told to use the bond proceeds for specific activities, like bridge replacement; and its legislature is now writing legislation for specific projects, including for federal earmarks, for work that wouldn't otherwise make it into the program. For bonding or revenue initiatives, the states said it is important to show infrastructure and service conditions and how they have changed over the years. That is where asset management comes in. It is important to talk to the legislators and show them the numbers. And states should include in this what happens if they don't maintain the system, showing what it will look like in five and ten years. Under each scenario the legislator can see the outcome of funding decisions and be asked if the outcome is what they would like.

One state reported conflicts over retaining bond funds for investment at the state level versus having the money legislatively earmarked for local governments that maintain the state system. Other states reported little control by their legislature over programming. One said it picked all the major projects for ten years up front. It might not be a good idea, but the legislature passed the bonding bill anyway. Their examples became the program, and it's not good to be ten years in front and have no flexibility with too-specific a program when showing legislators what they

are going to receive. Hindsight shows this is not a good idea. However, the states said they are going to have to show more ties between new revenues and what legislators and their constituents receive for the money.

Another state sold over \$1 billion as a bonding package, with bridges on the interstate as a program need and with performance targets, but not as individual projects. The bonding package was sold as an economic development package as much as an infrastructure replacement package, and with performance targets for the State Transportation Commission to manage. The commission was directed to get public input on performance targets and on project selections to carry out the program. The commission ended up with substantial tracking of what it accomplished, emphasizing economic enablers. The commission had to adhere to a process and had to track economic impacts.

States commented that when a complete list of projects is adopted for a bonding program, people start to feel they are not getting their fair share. One state proposed a program with a list of where the money was going, and there were objections from others advocating project not on the list. So, the legislature said the state can only use the money the legislature earmarked for some projects they identified and no more, thus limiting the budgets for some projects and making managing the projects very difficult. Another state had legislative earmarks but worked with the legislature to get a sensible list. The state strove to show regional equity, which was difficult with only one major metropolitan area in the state. Another state worked on investment criteria and avoided politicizing the process. Now it must report on meeting the criteria. Another state reported doing a statewide needs study; the state was divided into regions, showing how statewide equity was being accomplished with regional allocations.

Another state reported that when economic times are good, and the general fund is whole, the legislature is positive. When the economy goes in the tank, the legislature looks to cut transportation funds, but no diversion has happened yet, although some general economic development funds that had flowed to transportation are now terminated.

One state said it had a priority system for projects and that its legislature views the whole highway program budget as a list of projects, including maintenance. The state did not have a good presentation of its program, having conducted it from an engineering perspective. The state could not adequately give priorities at a statewide level as it micro-managed at a project level. Within silos the state had what was important, but not across silos. So, now at the regional level, this state worked to establish priorities and then meshed them at the state level. This year was the first time that program result have gone to the legislature. Turnover at the legislative level means long-term commitments are difficult; re-educating folks every two years does not fit well with long-term planning. Asset management showed them how to define projects that were important, and brought consistency to the long-term plan. Other states reported their governors can only serve one four-year term, so they have a similar problem. Asset management helps present the long-term view in that case too.

It was stated that asset management is a way of thinking. One has to change the agency's culture for it to work, to start walking before riding, and to try not to do it all at once. Once people see it working, they will come along for the ride (not everything all at once). This state now brings all

of its asset champions together to listen and learn from each other and to get better mutual understandings of priorities.

Another state commented that within individual silos there is good expertise, but they are advocates for their areas. They have not applied adequate resources to the trade-offs process and need goals or performance measures to help better cut across silos. That state still works with set-asides for things that don't fit the general priorities across the silo system.

One state explained how it was told to take budget reductions, and told to take them in administration and information technology cuts, hampering this state's ability to support the asset management process. It was noted that when push comes to shove on limited resources, administrative support money often ends up on the cutting floor. It is all about projects, not support. So support of the asset management process, and for gathering the data it needs, is difficult. Thus it is difficult to get beyond the silos. Most states are more "mature" on data for hard assets vs. operations and performance-based data needs. Safety, mobility and reliability, liability-related issues: data for these are all more difficult to fund in the distribution of resources because states lack the mature data systems characterized by physical assets.

Some states have legislatively committed to asset management, but the agencies have had to go back to the legislature to define asset management and to show legislators what they are doing with performance measures and to explain results the legislators don't understand.

A key is to identify goals that drive the development of strategies, ones that get everyone focused on same thing. For example, federal goals might drive the categories and agreement on a focused direction. States must have strategic safety plans to qualify for spending safety funds; they need the same type of plans in other key areas. These goals should include the criteria to flex funds from one area to another, or one program to another, in response to the goals. States will not develop a seamless transportation system with these current conflicting guidelines if they cannot put the money to what is needed; it is too disjointed now.

Asset managers (champions) need to meet on a regular basis to discuss asset management and the decision-making process. The weakness is in the trade-off between silos from both the resource allocation and data sides. Outside of physical assets areas (pavements and bridges), there are issues with safety, mobility, reliability, service, lack of resources, etc. There should be a corridor-focused management of the system, with different levels for condition, capacity, and service. This management structure should also include other modes and other jurisdictions, particularly for interconnectability.

Performance measures are needed across asset classes, ones that simplify comparisons.

Asset management is a way of doing business and a culture.

Resources are needed to make compromises between asset classes.

Data for asset managers vs. data for resource allocation is an internal tension.

Safety and preservation should be included as part of the asset management process.

The asset management process must support auditability of its management and funding level discussions.

Economic development considerations frequently lead to increasing demands for investment.

Operations vs. preservation, restoration, and improvement: operations is defined as including safety, traffic movement, snow and ice control, etc...

The corridor view for performance expectations is contrasted with the system level view. Transportation corridors are not highways only.

Having too much debt to service has resulted in an inability to allocate resources to needed projects.

A state commented that adding maintenance costs to the asset management process adds credibility. It pays off with credibility in the legislative process, including the gain of new funding. Preservation has been a first priority for years for many states but has become more difficult to sell in more recent tight budget times. This state found that by including safety in the program, preservation started selling well again.

One state reported using approximately a 20-percent weighting factor for regional projects for economic development. The state did this by obtaining input from regional planning agencies on the list of potential projects. This state views economic impacts as starting to factor into the asset management process.

Another state reported using a sophisticated economic model of routes for freight movement to assess existing routes to aid in the economic analysis of projects.

It pays off to have the Legislative Budget Committee leadership understand the concept of asset management.

Two years ago the state administration changed, and it shifted the focus to preservation first, which postponed expansion projects. This caused debate as expansion projects are too often seen as driving economic development.

Some states sub-allocate funds to regions and have the regions provide input to the state on priorities for region. Others get regional input and take it to the statewide priority process. One state brought everyone into the statewide process, including regional representatives as well as agency staff and other organizations, through a single meeting for all participants. "I like the process even though I don't have a project in the program for five years," a regional representative said – that's some buy-in!

A state commented that system preservation is not its number one priority; rather, operations is. Operations is number one; system preservation is number two. This state asked if most folks include operations with preservation, or is preservation number one and operations below that? This state's order is: operations, preservation, restoration, improvements, and expansion. The state legislature is buying it, and safety is in operations with the traffic element; also operations includes day-to-day maintenance, such as snow and ice removal.

Several other states commented, saying they must have infrastructure and preserve it to have operations. They asked, "Can you move traffic without centerlines and over potholes?" While there was some debate, the consensus was that system used needs to be as efficient and effective as can be, for whatever they've got.

There were some states who viewed preservation and operation expenditures as an economic development investment because of concerns for things like service reliability. For trucks, dependability or reliability of existing facilities is a big concern when discussing economic development, as contrasted with the view of economic development being something that is created by building new or wider roads to an economically disadvantaged community.

The question was asked: Which is the focus: worst first or corridors? Even for preservation programs, are all roads created equal? "NO" seemed to be the consensus! So, the follow-up question was asked: "What are you doing about disinvestment management?" Several states reported maintaining different levels of service. Missouri's approach was cited as an example. Like "context-sensitive design," Missouri uses project-sensitive design in preventative maintenance. So, it guides "practical engineering" and how far to go with improvements (e.g., a bridge needing repair on road that won't be widened or modernized for twenty years or more, if ever). So the state constrains what it does with the bridge, thus constraining the level of service as guided by the remainder of the corridor. This is at odds with the conventional engineering philosophy of "touch it, fix it to full standards" (to FHWA standards) because of the attorneys and fear of tort liability.

Another state uses a corridor approach for project selection, rather than improving one bridge at a time, with a five-year or more need programmed as one coordinated project. This state uses corridor performance measures, with corridors evaluated in economic impact analysis terms, for evaluations such as for functionally obsolete bridges.

It was noted that not every lane mile of highway should be treated the same, and averages don't cut it. Several states have a stratified system guide (corridors, routes, segments) for performance level goals. Their emphasis now is corridor, not silo, projects. These states look at whole corridors but acknowledge they can't seem to get low volume roads into the program. And they look at other transportation systems in the corridor (e.g., rail and connectivity for corridor/interconnections).

An agreed upon and publicly accountable set of relevant performance expectations is important.

System preservation is the top priority, but states consider adding safety to the program.

On the topic of system preservation and its relationship to economic development, several states said economic development might be part of the weighting criteria. Oregon, for example, developed a model to assess the impacts of transportation investment on economic development. Michigan did some work on the topic, and a study by the University of Michigan is available on the DOT's web site.

Operations vs. preservation: Are they the same? They could be linked to reliability and then to economic development.

Michigan reported on its statewide Transportation Summit program (one and a half days). All interested parties were involved with modal interests and all jurisdictions participating. The program provided more questions than answers but united a common vision and expectations for transportation. It established transportation as a focus and priority. The format for the group meeting shared many viewpoints with an open door to new ideas. The broad participation helped people understand transportation is everyone's business. Nothing moves without it; transportation is a state priority. And the program helped to create a great focus on safety! Participants also centered on raising revenues. They said they haven't had much of a problem with asset management resource allocation because there isn't much money anyway! (But other states said that's when asset management is more critical!) The vision setting helped the people who participated understand all the needs. While they initially understood traditional road and bridge needs, most participants didn't really understand other transportation needs until the vision summit.

Kansas said that when it was getting ready to develop the state's ten-year plan in 1998, the governor established a transportation study group to hold hearings around the state. This private group formed itself from some interested parties with the intent of facilitating the study process as well. It provided input that linked with and brought out non-traditional input, like bike and pedestrian needs, etc. The study group was very helpful in reporting to the governor and in developing plans for moving the transportation program ahead, including adding a new (first time) airport program and increasing the emphasis on transit.

The topic of benefit/cost analysis was raised, with the question: "Is that a good thing to try doing?" One state reported that when it tried this type of simple model a long time ago, the benefit/cost ratio favored a lot of very simple preservation investment and the big capital projects went by the wayside. This state is now using a linear programming model that should fractionate it a bit and provide more useful input.

In summary, and in ending the discussion, Tom Maze noted that every state is different in structure and need, and that today "we heard about a lot of views and experiences that can help us all."

APPENDIX C: LIST OF AASHTO WORKSHOP ATTENDEES

Attendance:

Name	Organization
Dennis Slimmer	Kansas Department of Transportation
Mel Adams	Vermont Agency of Transportation
Scott Bennett	Arkansas Highway and Transportation Department
Cathy Nelson	Oregon Department of Transportation
Kevin Chesnik	Wisconsin Department of Transportation
Tim Henkel	Minnesota Department of Transportation
Terry Heidner	Kansas Department of Transportation
Roger Safford	Michigan Department of Transportation
Dave Geiger	Federal Highway Administration
John L. Craig	Nebraska Department of Roads
Steven Hutchinson	Idaho Transportation Department
Bob Walters	Arkansas Highway and Transportation Department
Kirk Steudle	Michigan Department of Transportation
Paul Wells	New York State Department of Transportation
Greg Largan	Idaho Transportation Department
Rick Smutzer	Indiana Department of Transportation
Rick Whitney	Indiana Department of Transportation
Neil Pedersen	Maryland Highway Agency
Douglas Simmons	Maryland Highway Agency
Richard Woo	Maryland Highway Agency
Joe Darling	New York State Department of Transportation
Roger Safford	Michigan Department of Transportation
Tom Maze	Iowa State University
Omar Smadi	Iowa State University
Ian MacGillivray	Iowa Department of Transportation (retired)

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