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AASHTO **Transportation** **Asset Management Guide**

A FOCUS ON IMPLEMENTATION

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Preface

The *AASHTO Transportation Asset Management Guide—A Focus on Implementation*, aims to encourage transportation agencies to address strategic questions as they confront the task of managing the surface transportation system. Drawn from both national and international knowledge and experience, it provides guidance to State Department of Transportation (DOT) decision makers, as well as county and municipal transportation agencies, to assist them in realizing the most from financial resources now and in the future, preserving highway assets, and providing the service expected by customers. Divided into two parts, Part One of the implementation guide focuses on leadership and goal and objective setting, while Part Two is more technically orientated.

This implementation guide is based on research conducted under National Cooperative Highway Research Program (NCHRP) Project 08-69, *Supplement to the AASHTO Transportation Asset Management Guide: Volume 2—A Focus on Implementation*. AECOM served as prime contractor for the research with the assistance of subcontractors Paul D. Thompson and Spy Pond Partners.

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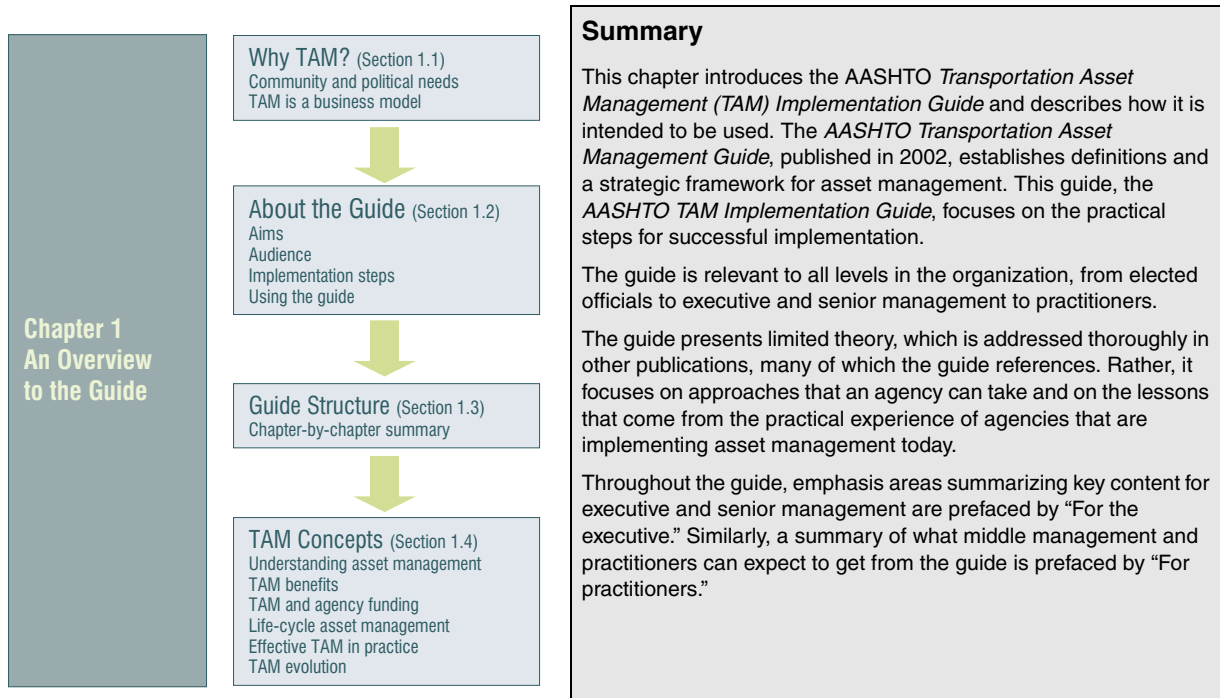
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Chapter 1

An Overview to the Guide



For the Executive

Successful implementation of Transportation Asset Management (TAM) is fundamentally about good management, effective leadership, and achieving the right organizational culture. It does not happen overnight, and requires consistent direction, focus, and attention over time. This guide describes the key tasks as a “step-by-step” sequence that an agency can pick up and act upon. While this guide is primarily targeted at state DOTs, it is also relevant to any agency managing transportation assets—highways, local roads networks, or transit facilities.

- An agency using this guide to implement TAM should involve all levels within the organization, from the executive through those involved in program delivery. Ideally, TAM should be an accepted way of doing business at all levels.
- The guide addresses key questions confronting agencies today, including how TAM can help with
 - cross-silo or multi-modal programming, transcending ingrained funding and operational “silos”;
 - setting cross-silo goals and objectives to deliver better outcomes, reduce costs, and maintain or improve service standards; and managing resources provided by other agencies and allocated within “silos,” such as federal funds.

The last point links closely to the question of optimal use of the pool of funds available to an agency. As different funding sources are often specifically allocated to different activities by formulas, an agency needs to make a strong business case to the funding provider if it wants more flexibility in making re-allocations and trade-offs. Political decisions may also need to be made. TAM can support the business case and the political environment, by providing better information and greater certainty based on an assessment of all the relevant factors, such as service standards, asset condition and performance, future demand, engineering needs, economic analysis, and financial planning.

The early chapters of this guide focus on leadership of TAM implementation, goal and objective setting, creating alignment within the organization, and documentation of the asset management plan. These are the most important chapters for the executive and senior management. While the remaining chapters are more technically oriented, an appreciation of each of the topic areas is valuable in understanding the wide scope of TAM's business processes, systems, and data requirements.

TAM is a business model, a decision support system, and a management approach which can be used across an agency to deliver corporate goals and objectives. TAM is not just a tool or "an end in itself."

Key TAM terms and concepts in practice are explained, and the guide shows how asset management adds value by integrating and enhancing agency activities.

Ultimately this guide is about organizational change and building a culture that supports continuous improvement and that is focused and measured based on performance of its mission. The *AASHTO TAM Implementation Guide* fills in the gaps between an agency's mission as the public understands it, and the nuts and bolts of mission accomplishment by means of transportation assets.

For Practitioners

As well as providing a wide perspective of TAM through the early chapters, the guide offers the practitioner a wealth of practical information and guidance. Its modular structure, particularly for Chapters 5 to 8, is intended to provide the reader an easy to access list of topic areas to assist with day-to-day problem solving, direction, or further study.

TAM helps in better managing assets; provides support for decision making; provides the tools to make the right choices consistently, efficiently, and in a timely manner; and both encourages and provides the tools for planning, programming, and budgeting.

1.1 Why TAM?

For the Executive—This is a key section, providing a high level rationale for executive and senior management interest in and commitment to TAM. TAM transcends community and political interests, and should be a key focus in managing the organization. TAM links what is needed to deliver the service with the justification for funding.

For Practitioners—TAM can be seen as an organization-wide approach, rather than an activity undertaken in a single department at a lower level.

1.1.1 TAM Addresses Both Community and Political Needs

Transportation assets are rarely valued or appreciated for what they are; rather, they are valued for what they allow people to do. Infrastructure supports the nation's economy and lifestyle, enabling mobility while providing an acceptable level of speed, safety, security, comfort, and reliability. The creation of infrastructure enabled the settlement and industrialization of the United States, and today it provides connectivity for people among homes, jobs, services, and recreational opportunities; and efficient paths for movement of goods from suppliers to consumers. Today, transportation assets are a major component of the community image, and a major fraction of government spending.

Transportation agencies in the United States have a long history of building roads, bridges, transit systems, and other infrastructure and managing an expanding asset base. However, over the past decade there has been a growing awareness that current methods of transportation infrastructure management are inadequate to meet the demands of American citizens and industry. With the published reports of two presidential and congressional commissions (U.S. General Accounting Office), it is clear that the general public and elected federal, state, and local officials will be demanding from transportation agencies and providers

- greater accountability in the effective use of federal funds,
- an increased relationship between performance and funding, and
- more sustainable transportation solutions.

Furthermore, there is a growing reluctance to provide funding through formula programs and instead to rely more on substantive analysis of infrastructure need. This framework would affect not only a greater competitive environment within the transportation modes, but also act across traditional modal funding.

TAM is therefore needed to meet the new demands of a rapidly changing transportation business environment. Traditional management methods will no longer be sufficient to meet 21st century business and political demands. Implementing TAM represents good public policy and service.

1.1.2 TAM Is a Business Model

While the term TAM may be new, many of the business processes have been around for a long time. Nevertheless, TAM is more than just doing what was done before under a different name. It involves the collection and integration of multiple practices into a coherent and managed whole, the establishment of new approaches to asset management problems, and the linkage of business processes to measures of the agency's mission and goals.

The asset management cycle is a sequence of integrated business processes. All transportation agencies have the fundamental business processes required for asset management. However, agencies vary widely in the effectiveness of these processes, particularly the ability to maximize the accomplishment of the agency mission by means of asset management. The *AASHTO TAM Implementation Guide* therefore adopts a dynamic approach to implementation: determining the agency's current maturity level relative to a long-term vision of asset management; identifying achievable near-term objectives for an improved process; making the organization ready for improvement; documenting the current and improved processes and their results; and adopting the practical skills and tools that are required.

There is no "one size fits all" TAM solution for an agency. There are many reasons why the appropriate level of asset management practice varies among organizations, or within an organization, as TAM practices consolidate. These reasons may include

- Agencies vary in their level of asset management maturity, knowledge, experience, political and physical environment, and resources.
- Some aspects of TAM, such as consultation with customers over levels of service, may be totally new to the agency.
- Agencies may wish to integrate other aspects, such as demand forecasting, risk management, asset criticality, asset valuation, and cost optimization.
- The characteristics of different transport networks vary considerably. For example, the needs of a sparsely populated county may differ significantly from those of a major metropolitan area or of an interstate system.

TAM implementation addresses "five core questions"¹;

- What is the current state of my assets?
- What are my required levels of service and performance delivery?
- Which assets are critical to sustained performance delivery?
- What are my best investment strategies for operations, maintenance, replacements, and improvement?
- What is my best long-term funding strategy?

¹ Multisector Asset Management, Publication No. FHWA-HIF-09-022.

1.2 About the Guide

This guide takes as a starting point the *Transportation Asset Management Guide* published by AASHTO in November 2002². This guide, the *AASHTO TAM Implementation Guide*, is focused on implementing TAM. Both documents should be read and used together—they are complementary.

1.2.1 Aims of the Guide

The *AASHTO Transportation Asset Management Guide* provides considerable background information about Transportation Asset Management, the advantages of using TAM, and an approach that agencies can use to identify where they are now and where they should focus their asset management efforts. While some guidance on implementation is given in the *AASHTO Transportation Asset Management Guide*, there is much more detailed “hands-on” information that is needed. This guide is intended to fill that gap. It aims to stimulate transportation agencies in addressing strategic questions as they confront the task of managing and overhauling America’s surface transportation system, such as

- What do we want to accomplish, and why?
- What alternatives are available for changing the current business model to achieve these objectives?
- What resources are available to succeed in this mission?
- How do we measure success?

The *AASHTO TAM Implementation Guide* is presented in three key parts:

- Part 1: a focus on organizing and leading TAM. Of most interest to executive management.
- Part 2: a focus on processes, tools, systems, and data. Of most interest to practitioners,
- Appendices, which include examples of asset management plans and four in-depth case studies of local and international agencies’ experiences in implementing TAM.

The guide is a “step-by-step” presentation of the tasks to implement asset management in a transportation agency. For example

- It describes the alignment of asset management strategies and levels of service with corporate strategic goals.
- It describes strategies for enhancing communication and information sharing among policy and technical decision makers as well as elected officials.
- It identifies obstacles to effective TAM implementation and provides examples of how they have been overcome in transportation agencies that have implemented TAM.
- It describes ways to overcome cross-organizational or cross-functional “stove-pipes” in decision making.
- It demonstrates through case studies how TAM not only generates greater infrastructure performance and output per dollar, but also how much more effective staff can be when working in the TAM business model.
- It describes the use of tools for evaluating return on investment and improving economic efficiency, and addresses issues such as risk management, resource allocation, and budgeting decisions associated with implementing TAM.

² National Cooperative Highway Research Program (NCHRP) project 20-24(11).

- It describes ways in which ERP systems and other information systems can be linked to support effective implementation of TAM.
- It demonstrates through the use of case studies how transportation system performance can be enhanced by implementing TAM practices and principles.

1.2.2 Intended Audience: Who Should Use the Guide

The guide is an important tool which should be actively used as a reference by the transportation community. The principles and implementation techniques described here are universally applicable to all agencies managing transportation assets. So, while the target audience is primarily state Departments of Transportation (state DOTs), local agencies managing metropolitan, county, or mixed transportation networks will find it just as useful and appropriate to their needs.

It is structured so that a reader can use a particular section or topic as a source of advice (typically a practitioner) or use the whole in order to drive a systematic agency-wide implementation (typically the executive). The intention is that the *AASHTO Transportation Asset Management Guide* and the *AASHTO TAM Implementation Guide* be used together to develop and improve an agency's understanding of TAM, and that the *AASHTO TAM Implementation Guide* helps agencies to improve their implementation of TAM.

For the Executive—The guide is intended to raise awareness among senior executives about the wider role TAM plays within the agency, and how it can be implemented to improve organizational performance and achieve better outcomes in terms of cost and service to the public.

Agency-wide TAM implementation needs to be led by top management using the principles of effective leadership. A key objective is to develop a culture where people understand and believe that “all of the assets are our assets and together we take care of them” rather than “this set of assets (for example, pavements) is mine and I am not concerned about the others.”

TAM is an organizational culture and professional discipline that should not be switched on and off with the regular election cycle—it needs continuity and a willingness to provide support as leadership within the organization changes. Implementation needs to transcend administrations.

For Practitioners—People involved in middle management, engineering, planning, maintenance, finance, public information, and information technology should all take an interest in the content and application of the guide. These professional fields will need to work together and break down persistent barriers of communication in order to achieve a high-functioning asset management process. Thus, the guide features a glossary and numerous overview sections to help bridge the gaps in understanding that often exist.

For External Stakeholders—The guide is also useful to elected officials, external stakeholders, and oversight bodies. The early chapters contribute to a more general reader's understanding of the scope of TAM, organizational aspects relating to leadership, creating alignment and setting direction, and the role of the Transportation Asset Management Plan (TAMP) as a communication and management tool.

1.2.3 Implementation: The Key Management Steps

AASHTO has developed this guide in the belief that a “how to” publication will help agencies to enhance and integrate TAM thinking and culture within their organizations. This will help the nation to better address the long-term challenges of efficiently and cost-effectively managing an ever-growing and aging transportation asset base, preserving the investment made in it by the community, and ensuring that it can provide service for generations to come.

Implementation can be seen as a series of steps, which are woven into the structure of the guide:

- Step 1: Set agency goals and objectives
- Step 2: Perform an agency self assessment and TAM gap analysis

- Step 3: Define the scope of TAM in your agency
- Step 4: Develop the change strategy
- Step 5: Integrate TAM into the organizational culture
- Step 6: Integrate TAM into business processes
- Step 7: Establish asset management roles
- Step 8: Establish performance management standards
- Step 9: Develop a TAM Plan
- Step 10: Use enabling TAM practices, business processes, and tools to support decision making—a focus on service planning
- Step 11: Use enabling TAM practices, business processes, and tools to support decision making—a focus on life-cycle management
- Step 12: Use enabling TAM practices, business processes, and tools to support decision making—a focus on TAM integration
- Step 13: Use information systems to meet cross-organization TAM implementation needs
- Step 14: Identify the data needs for effective TAM, and carry out data collection and management

Figure 1-1 identifies which chapters deal with each of these steps. From a management perspective, Steps 1 to 9 in Part 1 of the guide are the ones that drive TAM, while Steps 10 to 14 in Part 2 deliver the supporting tools, systems, and data needed.

It is important to recognize that while a sequence is presented here, in practice the steps will overlap or may occur simultaneously. For instance, developing the right culture usually takes time as people within the organization become more experienced in using the tools and systems that are part of the latter group.

Step 9, develop the TAM Plan, may be initiated early on to help document the TAM implementation process, and then be progressively improved and filled out over time. It may begin as the Asset Management Implementation Plan, described in the *AASHTO Transportation Asset Management Guide* as a means of documenting priority action areas. This plan is typically produced in Step 2 and, along with the priorities and tasks identified in the gap analysis, is a key input to Steps 3 and 4.

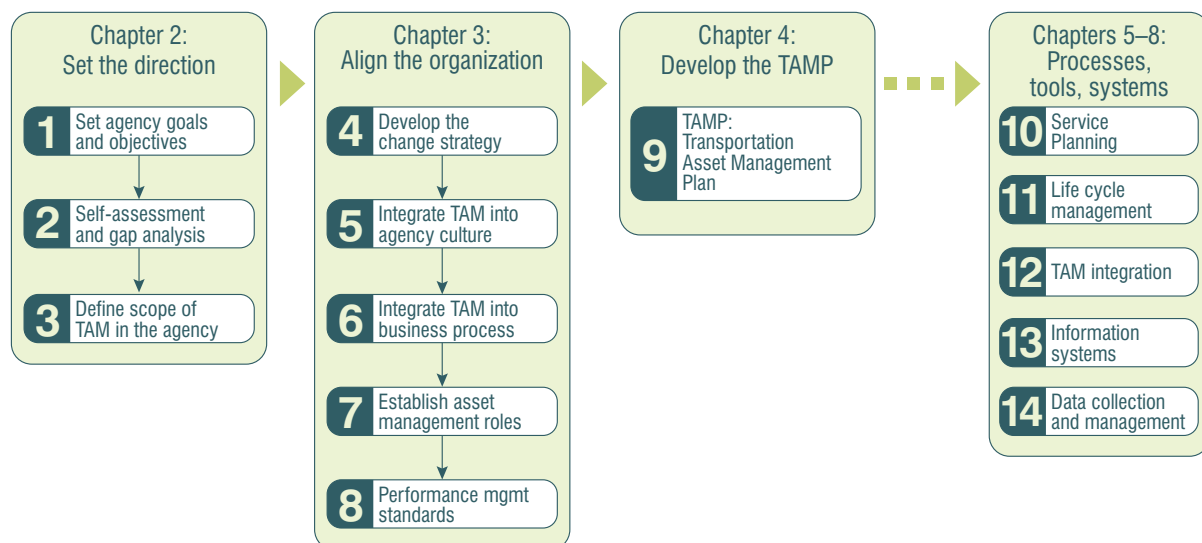


Figure 1-1. TAM Implementation Steps

Steps 13 and 14 will usually be carried out in close association with Steps 10, 11, and 12.

An organization's strategy might therefore be sequential from the beginning, or if already advanced in the early steps it might pick a point along the pathway and make fewer steps. This list of steps provides a "big picture" context of TAM implementation for the organization's leadership.

1.2.4 Using the Guide to Implement TAM: Where to Begin

Implementing TAM is a process of continuous improvement. TAM is an agency-wide process not an independent specialist activity undertaken only by transportation engineers or practitioners. Its strategic direction and the strategic goals it seeks to deliver are elements of core corporate strategic policy, so the approach to TAM should be policy driven.

For the senior executive, whose term in office may be of limited duration, asset management implementation may be best conceived as an organizational change *project*, with a starting point and an objective on a two to four year time scale. The self-assessment and gap analysis define the starting point and set reasonable expectations as to what can be accomplished in limited time. The guide then sets out the individual management and technical tasks that must be accomplished and managed in order to reach the objective in the desired timeframe.

The *AASHTO Transportation Asset Management Guide* provides a general framework for understanding TAM from a strategic perspective. In the early stages of implementation the *self-assessment exercise* described in the *AASHTO Transportation Asset Management Guide* can be used to evaluate the agency's current position and organizational perspective. This will yield a broad-based TAM strategy and a prioritized high level business improvement plan.

The *AASHTO TAM Implementation Guide* expands on the implementation component of the framework. Chapter 2 provides a detailed TAM Gap Analysis to extend the self-assessment into individual business processes for tactical insight, drilling down to the specific TAM practices which need to be enhanced. It relates organizational change strategy and tactical decision making to the results of the gap analysis. Benefits of the gap analysis include

- It serves to help build consensus among the agency's managers.
- It assists the agency to identify strengths, weaknesses, constraints, and opportunities for improvement.
- It recognizes and prioritizes critical areas that need immediate attention.
- It provides a foundation for developing an improvement strategy.

A key output from the self assessment and gap analysis is the position of the agency on a "maturity scale," in each of the areas considered. At any one time, different agencies will be at different stages of TAM implementation. Within an agency, some practices may be advanced while others need to be improved. These tools will enable an agency to readily identify the logical next steps for improvement. The results identify entry points into three sets of implementation tasks:

- Align the organization. This entails a set of strategies and tactics for making the organization ready for change; in particular, readying the agency for a more explicit connection between agency mission and asset-related business processes—a performance-oriented culture.
- Strengthen enabling processes. Extensive practical information is provided on the tools and methods that an agency uses to measure its performance, to forecast future performance, and to use these forecasts to optimize project, policy, and program decisions.
- Strengthen information systems and data. This includes methods to tie data and information systems directly to asset management requirements in order to make an appropriate level of investment in systems.

All three of these areas feed iteratively into a core process of documenting the agency's asset management plan (Chapter 4). The Transportation Asset Management Plan (TAMP) is suggested as a valuable way of referencing and documenting TAM practices and knowledge and the *AASHTO Transportation Asset Management Guide* asset management implementation plan, shown in the diagram as the strategic action plan, should be an integral part of it (see Figure 1-2).

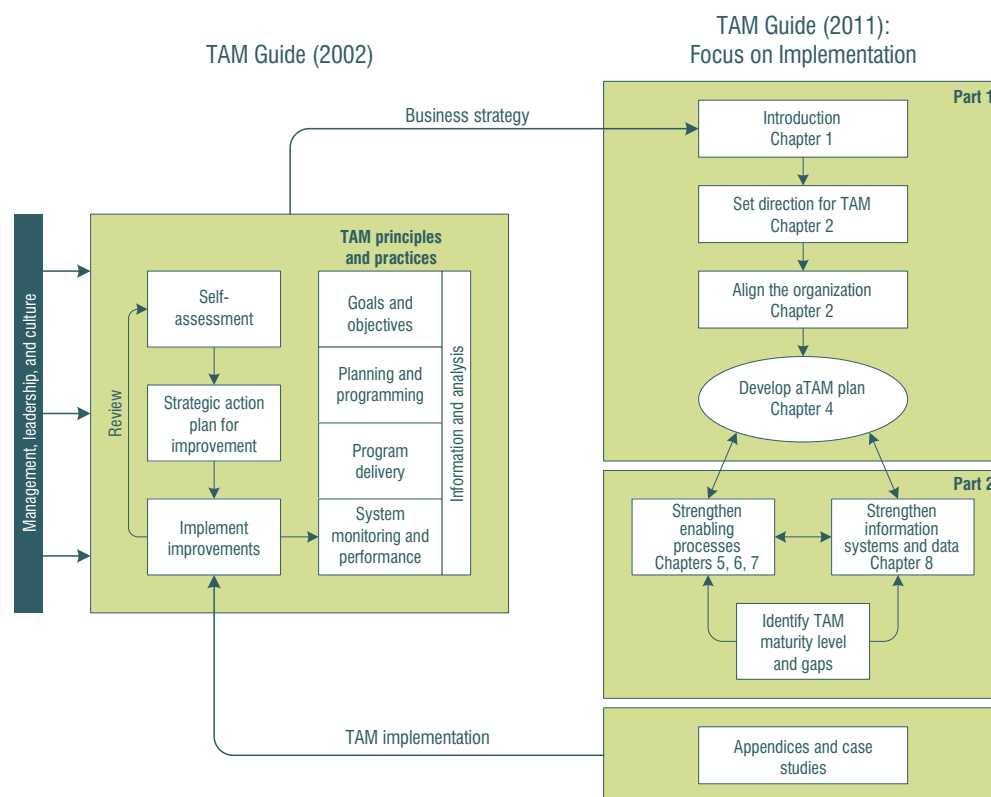


Figure 1-2. Roadmap to the AASHTO Transportation Asset Management Guide, published 2002, and the AASHTO TAM Implementation Guide

This is a high level framework for implementing TAM, but it is not necessarily the only approach. Some agencies may choose to use part of the framework and develop TAM in an incremental way, while for others it may be more appropriate to closely follow the framework and the order of the steps suggested in this guide. This decision should be based on a strategic appraisal of where the agency is now and what it wants to achieve. Keeping it simple, the easiest way to answer the “where do I begin” question is to “begin from where you are now.”

1.3 Guide Structure: Chapter by Chapter

For the Executive—This section explains which of the management steps are covered in each chapter. This provides a ready reference for using the guide.

For Practitioners—This section can be used to gain an overview of the structure of the guide. It provides a brief summary of the purpose and content of each chapter, to assist the practitioner looking for specific content or to aid understanding of the guide.

Overview

Chapters 1 through 4 provide the context and preparatory steps that any agency will need to undertake as it prepares for asset management implementation. The material in these chapters is broadly applicable to agencies at any level of maturity. In Chapter 4, differences emerge among agencies at varying levels of maturity, as the more advanced agencies will typically have more formalized and extensive TAMPs in place.

Chapters 5 to 8 are designed to be used selectively, depending on the priority areas of improvement identified by the gap analysis in Chapter 2. These later chapters are focused on the specific tools, methods, and information technology resources required in order to reach the more mature stages. The most mature agencies use all the tools described here. However, it is important not to be overwhelmed by their breadth and depth. Agencies climbing the maturity scale which might not use many of these tools today can set their own priorities for near-term implementation activities.

Chapter 1—An Overview of the Guide

Chapter 1 introduces the guide and provides linkages to the concepts and frameworks from the *AASHTO Transportation Asset Management Guide*, published in 2002. It provides a lead-in to using the self-assessment tool in the *AASHTO Transportation Asset Management Guide*, to establish a strategy and action plan for improvement, and introduces the concept and purpose of the TAMP. Practical meaning is given to key asset management terms and concepts, and how TAM adds value by integrating and enhancing the activities that agencies may already perform.

Chapter 2—Set Direction for TAM Execution and Improvement

Step 1: Set agency goals and objectives

Step 2: Perform an agency self assessment and TAM gap analysis

Step 3: Define the scope of TAM in your agency

Fundamental needs in TAM are to define direction and goals, and to ensure that these are aligned across the organization. This is particularly important where silo boundaries exist, such as between maintenance and capital. It is also necessary to link TAM to other departments within an agency, including finance, information technology, and human resources. This section describes the processes used for this purpose which include strategic business planning, policy development, and management systems planning.

The self-assessment approach described in the *AASHTO Transportation Asset Management Guide* is further developed and expanded. It includes the TAM Gap Analysis method for identifying specific improvement tasks relating to TAM business processes. The need to define the scope of asset management in an agency, discussed in the *AASHTO Transportation Asset Management Guide*, is expanded and developed.

Chapter 3—Align the Organization

Step 4: Develop the change strategy

Step 5: Integrate TAM into the organizational culture

Step 6: Integrate TAM into business processes

Step 7: Establish asset management roles

Step 8: Establish performance management standards

TAM is a management approach for achieving the highest possible mission performance from transportation assets. It will often involve change, and a strategic approach to implementing and managing change may be required. The importance of change leadership is reinforced and steps to doing this effectively are described.

TAM involves many parts of the organization and depends on two equally important and parallel sets of activities. First, management must set the tone for the agency; create a culture that supports TAM; define quantitative

overall and asset specific goals; communicate with people inside the agency to ensure alignment, support, and understanding; and work with external stakeholders and decision makers to develop understanding, support, and accountability. Implementation requires leadership.

Second, and at the same time, professional staff involved in the business processes must support management efforts with robust information, analysis, and implementation as well as commitment.

The roles and responsibilities for implementing asset management described in the *AASHTO Transportation Asset Management Guide* are expanded and further explained. The needs are developed in this section, and a performance management framework is established.

Chapter 4—Transportation Asset Management Plan

Step 9: Develop a TAM Plan

This chapter describes the general structure of the TAMP and provides a guide to writing and updating it. The TAMP discussed in this section is a much broader document than the Asset Management Implementation Plan described in the *AASHTO Transportation Asset Management Guide*, which is a key part of the TAMP.

The TAMP may not necessarily be a single self-contained document, but may be a collection of documents and other presentations that accomplish the same objectives of making asset management transparent and consistent across the agency. The TAMP can be a very useful way of summarizing or referencing these documents and practices, and for some agencies a useful way of characterizing the TAMP may be as a “virtual library.”

Development of the TAMP is a continual and an iterative process, which does not have to be perfect in the first attempt. While the motivation to improve TAM practices and develop a TAMP may originate at any level in an organization, it is essential that the decision to pursue it and to develop and implement a TAMP is made at the highest appropriate organizational level. It must be recognized that a TAMP needs to be appropriate to the nature and scale of the agency and the assets that it manages.

Chapter 5—Enabling Processes and Tools for Service Planning

Step 10: Use enabling TAM practices, business processes, and tools to support decision making—a focus on service planning

This chapter describes the enabling processes and tools for developing high level agency performance measures and how they are linked to the levels of service provided to the agency’s customers. It also describes how transportation planning and growth and demand forecasting are linked to asset management. Risk management is also covered in this chapter. The primary outputs from these processes are identified needs for functional improvements to the transportation system.

Chapter 6—Enabling Processes and Tools: Life-Cycle Management and Asset Preservation

Step 11: Use enabling TAM practices, business processes, and tools to support decision making—a focus on life-cycle management

This chapter describes the enabling processes and tools that support life-cycle management of the agency’s asset portfolio and its preservation. The outputs are identified needs in such terms as operational activity, maintenance, preservation, and ultimate reconstruction.

Chapter 7—Enabling Processes and Tools for TAM Integration

Step 12: Use enabling TAM practices, business processes, and tools to support decision making—a focus on TAM integration

This chapter describes the enabling processes and tools that support integrated, cross-functional decision making. The outputs from the processes described in Chapters 5 and 6 must be linked in program planning and program delivery. This involves cross-organization TAM processes. The use of asset valuation and sustainability practices are also described here.

Chapter 8—Information Systems and Data

Step 13: Use information systems to meet cross-organization TAM implementation needs

Step 14: Identify the data needs for effective TAM, and implement data collection and management

Many aspects of asset management rely on quality data and efficient processing of data to produce information. In a great many cases, especially in more mature organizations, asset performance data are useful and used in many ways by many people across the agency. Asset management maturity implies certain requirements for systems integration, information architecture, data structure, system selection and development, and data quality. This chapter describes approaches to an organization's information systems environment and common implementation strategies.

1.4 Important TAM Concepts

In order to gain a basic strategic perspective on asset management in preparation for the chapters that follow, the following sections review the most important ideas from the *AASHTO Transportation Asset Management Guide* and describe some new insights gained by agencies implementing asset management in the eight years since publication of the *AASHTO Transportation Asset Management Guide*, in 2002.

For the Executive—This section provides a background overview of TAM and its benefits and features such as improved stewardship, improving access to funding, understanding the economic value of assets, economic efficiency, TAM effectiveness, and how TAM evolves in an organization as a continuous improvement cycle.

For Practitioners—This section will help the practitioner understand the “bigger picture” of TAM in an agency, and therefore gain a better understanding of their role in contributing to its successful implementation.

1.4.1 Understanding Asset Management

Agency experience in the implementation of TAM has led to a refinement in the way it is defined and understood.

What Is TAM?

The definition of TAM has changed since the *AASHTO Transportation Asset Management Guide* was published in 2002. The *AASHTO Transportation Asset Management Guide* defined TAM as “a strategic approach to managing transportation infrastructure” and it also said that it is “at its core, a process of resource allocation and utilization.”

Other international references provide definitions of asset management, such as the *International Infrastructure Management Manual* (IIMM) (National Asset Management Steering Group, 2006). This reference describes asset management as “the combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner.”

In NCHRP Report 632 (National Cooperative Highway Research Program, 2009) AASHTO has extended its definition, taking into account local and international definitions. It states that “*Transportation Asset Management is a strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively throughout their life cycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well defined objectives.*”

Purpose of TAM

The IIMM states that the purpose of asset management is “*To meet a **required level of service**, in the most **cost effective manner**, through the management of assets for **present and future customers.**”*

The bold text has been added to emphasize three key concepts, which are fundamental to TAM. They extend the meaning of the definition to encompass the performance of assets in delivering services and the relationship between assets and the people who use them to obtain a service. It also emphasizes the long-term focus of asset management—recognizing sustainability and affordability.

This purpose is a very important distinction that the international perspective brings to asset management in the United States. The fundamental purpose of TAM is not to simply provide and maintain assets for the sake of it, but to provide and maintain an agreed level of service to customers, utilizing assets at the agency’s disposal. This purpose is a “snug fit” with the concepts of “asset preservation” that are currently being advanced at all political levels in the United States.

The Total TAM Process

TAM needs to be embedded in the business planning processes of an agency, from strategic through tactical to operational planning. TAM includes the development of asset management policy, an organizational statement that can establish the framework for securing alignment and providing direction for asset management planning. It extends through producing and using the TAMP to daily operation of facilities and reporting on the achievement of programs and outcomes. TAM can be visualized as a sequence of integrated inputs, business processes, and outputs as illustrated in Figure 1-3.

TAM is therefore wider than a simple focus on maintaining or preserving assets. TAM follows a path from the inception of the need for an asset to its creation, operation, maintenance, preservation, replacement, reconstruction, improvement, and possible eventual disposal. This guide illustrates how TAM is more than just tools, but rather, it represents the integration of tools with organization, leadership, people, and business processes. It also incorporates other important processes such as risk management and sustainability.

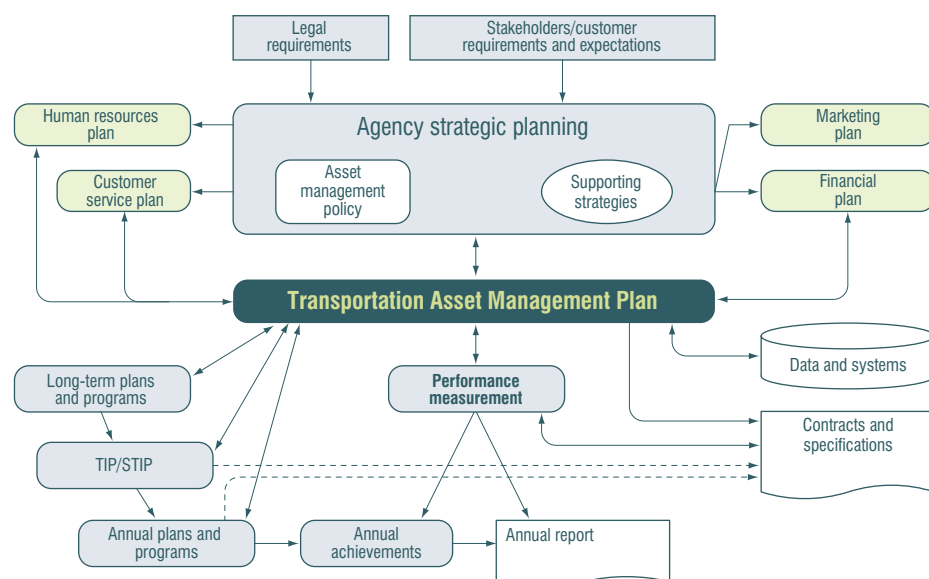


Figure 1-3. Asset Management Drivers and Relationships

The TAM Plan is a key management document for tying the agency's strategic goals and outcomes, or performance measures, to the maintenance and capital programs that it delivers. The management cycle is completed by having more detailed, lower level performance measures to both determine the effectiveness of the agency's programs in achieving the outcomes (e.g., safety, asset condition, travel times, etc) and its efficiency in completing the programs (e.g., output measures such as lane-miles resurfaced, projects completed on time and on budget, etc.). Many of both types of these measures will be publically reported.

1.4.2 TAM Benefits

TAM, as a management discipline, yields benefits to the agency in the way that it directly ties essential business processes to quantitative measures of its performance. One of the key functions of asset management is to measure its own benefits in terms of performance, a capability that otherwise would not exist in most agencies. Many important benefits are described in the following sections.

Long-Term View

Emphasis on managing assets through their life cycles, which are often over 40-years and can stretch to centuries, helps staff, management, and stakeholders to realize that the assets are being managed for the long term, and that the concept of *ownership* ("it is ours to do with what we like") is able to be substituted with *stewardship* ("at the moment it is ours to care for and pass on to our grandchildren").

Clear Relationships, Transparency, and Accountability

A properly developed TAM process integrates the principles and practices of effective TAM at all levels in the organization. Because the TAMP is tied to corporate direction and strategy, and its procedures, methods, and programs deliver that strategy, corporate success is therefore "hardwired" into the process. Rather than being just a happy coincidence, the TAM process ensures greater probability of corporate goals and objectives being achieved.

Provides the Desired Levels of Service

Advanced TAM will deliver the agreed levels of service through financial programs coupled with effective management and reporting structures. TAM procedures and practices also firmly anchor the base for complying with legislation and meeting other regulatory requirements.

Plans for Growth

As a long-term process, key inputs to TAM include future growth forecasts, such as population and land-use, and the effects of future trends on the assets being managed. This may also recognize changes in user expectations relating to the services that the agency delivers through its assets. TAM is therefore forward looking.

Maximizes the Benefits of Infrastructure

Transportation assets are built to provide an agreed level of service, often explicitly in design standards. Transportation assets also cost money to build, maintain, operate, and use. By stressing the importance of life-cycle planning and costs and placing agreed levels of service at the core of the asset management process, TAM helps to ensure that the benefits delivered by the network are maximized while the costs of providing, maintaining, and using it are minimized.

A mature asset management process gives a comprehensive picture of asset performance, including mobility, travel time, condition, life-cycle cost, safety, reliability, risk, comfort, and externalities. Economic benefits to the agency, in terms of funding levels and life-cycle costs, are only one set of important benefits. Quantification of

transportation system benefits to road users, taxpayers, and society in general not only supports asset management processes, but helps senior management to advocate on behalf of the agency's mission with outside stakeholders as well as internal subordinates.

Case Study 1-1. Realization of TAM Benefits

The Colorado transportation system has experienced rapidly escalating costs, due to factors such as inflation, environmental events, and system growth. Funding shortfalls have increased the difficulties of meeting all of the state's transportation needs. With asset management Colorado DOT has achieved greater benefits investing its limited resources than it could have without the use of asset management tools. Asset management has also allowed levels of service to be better than they would have been without it.

Importantly, asset management has reduced the life-cycle costs of CDOT facilities by substituting preservation for "worst-first." The return on investment has increased significantly for bridges and pavements.

1.4.3 TAM and the Institutional Environment

Implementation of TAM has some profound effects on the agency's relationship with outside stakeholders. From an executive perspective, these effects can be leveraged to benefit the agency and the public. Fully exploited, they present some great risks and some great rewards.

TAM Enables Better Use of Existing Funds

TAM quantifies current performance, and also enables forecasting of future performance in a manner sensitive to policy and planning decisions. In a planning framework driven by quantitative level of service measures, TAM makes it possible to determine how well prospective decisions will accomplish the desired service levels.

Even without a change in funding levels, agencies can use this capability to generate alternative policy and program scenarios, and measure each against level of service objectives. The ability to generate and evaluate alternatives makes it possible to identify and select scenarios that are better in terms of financial or service, or both, outcomes than what might have been produced without quantitative assistance. The TAM process requires an assessment of

- The current services provided and the anticipated growth and demand into the future.
- The current state of infrastructure and the required financial need to maintain those assets into the future.
- The risks associated with not achieving the service levels and meeting growth expectations.
- The future financial requirement (taking into account infrastructure, service level, and TAM improvement needs) and the available funding.

An agency that has fully integrated TAM into its organization will optimize its decisions in relation to these matters and will apply TAM-based decision-making techniques to the optimal scope, design, and timing of programmed work. Predictive modeling will be applied to critical networks to identify optimal long-term replacement and preventive maintenance programs.

Methods for generating policy and program alternatives, and for evaluating them using cost and performance forecasting methods, are covered in Chapter 5 of this guide. Most agencies that desire to routinely take advantage of this capability decide to adopt various automated methods, called optimization procedures.

TAM Improves Agency Competitiveness for Limited Funds

In the United States and worldwide over the past 30-40 years, there has been a gradual trend toward decentralization of funding allocation authority and responsibility. As a result, the competition for scarce funds is increasingly played out in state legislatures and city councils, rather than in Federal legislation.

Agencies with mature asset management processes do not view transportation funding decisions as exogenous; rather, they try to proactively influence the amount of funding directed to their priority areas, even at the expense of funding for non-transportation programs. These agencies actively compete for their funding, and asset management is one competitive weapon. Figure 1-4 uses the asset management cycle to illustrate how public and elected officials view the asset-related functions of a transportation department. What the public would ideally perceive is that funding and a sense of priorities feed into the agency, represented by the shaded region of the diagram. In exchange for the funding and in accordance with the priorities, changes in performance are output.

When an agency is competing for funding against non-transportation programs or coming against political resistance to taxes and fees, it needs to make a strong case that more funding will result in better performance. Yet, the public often lacks confidence and understanding of what happens inside the shaded region of Figure 1-4.

Similarly, even if the total size of financial resources is compartmentalized and out of the agency's control, the organization may see opportunities to improve performance by reallocation of funds to higher-priority needs outside the usual bounds of funding program restrictions. The Federal government and often state funding programs have room for flexibility when a persuasive case is made for changes in the way existing funds are used.

Confidence and credibility are improved if the agency's actions and processes are transparent and open to scrutiny rather than opaque. Credibility also improves if there are sound processes to quantify the basic ingredients of asset management decision making, and if the agency can show that it routinely and predictably uses these tools to direct resources optimally to priority areas of investment.

When the agency is able to make credible forecasts of performance as a result of the funding they seek, and outside parties are able to verify the integrity of these forecasts from historical data, then political allies in legislative and funding bodies are much better armed and can thus be more effective.

The existence of asset management data, software, and processes in an agency does not guarantee greater funding. However, a coordinated strategy involving the agency, elected officials, and outside factors such as business and interest groups, make asset management into a powerful tool to help obtain the necessary funding—and plan and deliver the necessary projects and programs—to build an efficient, high-functioning infrastructure for a national, state, or regional economy.

TAM Helps Build Constructive Political Relationships

In an era of public cynicism toward government, the transparency offered by TAM can help executives who are so inclined to bridge persistent gaps of suspicion and miscommunication with community institutions, and with the public. Transportation agencies are frequently viewed by the public as rich and highly capable at best, or wasteful and ineffective at worst: often the same agency is viewed both ways at different times or by different groups. Executives know that the reality is more complex, but are often at a loss to communicate the agency's capabilities and limitations, to share ownership of its problems, and achieve the full measure of its successes.

An aspect of this problem that has manifested itself across the political landscape is the resentment of expertise, evidenced by popular anti-intellectualism, tax concerns, and general difficulty coming to terms with the complexity of modern life. It can be easy for experts to build walls of jargon that separate an agency from scrutiny and criticism in the short term, but breed suspicion and lack of support in the long term. It requires a conscious effort, a cultural paradigm shift, and considerable courage for an executive to change course in this environment.

Transportation Asset Management, at its best, provides hard information at a level that outside stakeholders can understand, verify, and relate to their own needs and objectives. It is a powerful communication tool for an agency wanting to use it.

The connections to funding issues described in previous sections represent just one area where a motivated executive can use TAM to foster constructive external relationships that help the agency thrive and help the

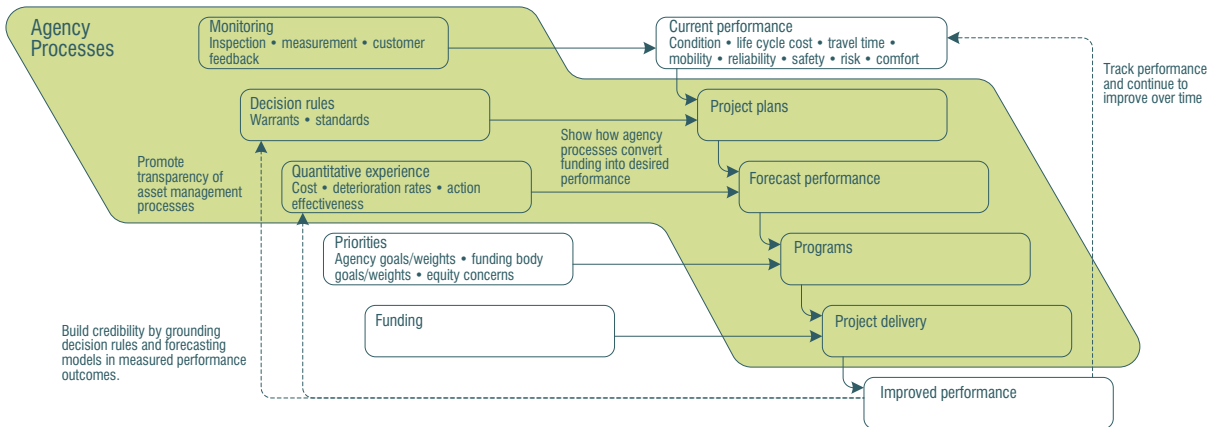


Figure 1-4. Transparency in Asset Management Decision Making

Case Study 1-2. Launching an Asset Management Change Cycle

Fred Wilson was an insurance salesman from Smithville when he was elected to the part-time job of State Representative. On his first day in the state capitol, Fred decided to accept an opening on the Legislative Transportation Committee. Although Fred knew little about transportation, he did know that his rural community's infrastructure had been neglected for years in favor of the high-growth suburbs and that this was making it even harder for his constituents to eke out a living.

Fred wanted to direct more maintenance funding to his distressed region, but his new colleagues quickly reminded him that their communities have dire needs as well. For Fred to help his constituents, it was not enough to try to get a bigger piece of the pie: he needed to make the pie bigger.

But this was easier said than done. He needed to line up the support of a majority of his fellow legislators for a gas tax increase, and to do that he needed to convince a variety of interest groups as well as the general public. At the same time he had many other legislative issues to consider outside of transportation, and still had to keep his insurance business going back at home. He needed help, but he had no volunteers in his district who were knowledgeable about transportation, and no authority or money to hire staff.

Fred came up with a novel idea. While he could not hire staff, and the state DOT had no staff to spare, he could direct some money to the DOT, earmarked for a transportation capital needs study. Fred's amendment was tacked onto an appropriations bill, which sailed through both houses and received the Governor's signature. The DOT hired a consultant who focused on planning and process engineering, and a successful multi-year implementation effort was begun.

The consultant's role in the effort was unusual at the time and non-obvious. The consulting staff did not know most of the key players, did not have an office in the state, and had no power to implement anything. But the act of selecting the consultant opened some long-dormant communication channels between legislators and DOT officials. The consultant seized this opportunity to act as a facilitator and translator, to find middle ground between competing interests. The consultant helped line up key stakeholders and trained all the participants on basic principles of asset management. With the external players together starting to ask the right questions, the DOT found an imperative to respond with improved internal asset management processes and tools. The nascent effort to develop a pavement management system received an added push and became a national model. In the end, Fred was successful in expanding the statewide transportation pie and improving the infrastructure of his own district as well.

community and regional economy to thrive by means of a strong infrastructure. Some other aspects of symbiosis include

- By clearly and consistently measuring the costs and benefits of proposed projects, and validating these estimates against completed projects, the agency helps the political process to allocate resources efficiently and equitably. These tools can help the community to participate more actively and buy in to agency decisions. The buy-in of active community leaders can produce committed political allies when the time comes to decide how to pay for the projects.
- TAM information can help the public understand where the money goes—what public benefits they buy with their tax dollars. The direct connection between cost and benefit that we all experience at a grocery store, is often lost in the political arena where public expectations for transportation are debated in a forum entirely separate from taxation. The public yearns for a simpler connection between cost and value, and it is in the agency's interest to provide it.
- Similarly, TAM information can help the agency to allocate money equitably among geographic areas, socio-economic groups, and political interests; and help the public to understand that it is being allocated equitably. It can reinforce the traditional role of the Transportation Commission in resisting the demands of the daily legislative tug-of-war for money.
- TAM information can foster competition: among agencies, among parts of the agency, and between the public and private sectors. It can help firms to plan and mobilize efficiently to keep their costs down. It can help the agency to make more effective use of the private sector to meet public needs. Effective and enforceable contracts demand that the agency can measure what it wants to accomplish.
- Better communication, fostered by TAM, helps the agency share ownership of its problems, so the public is willing to come up with money or adjust expectations when the economic climate interferes with accomplishment of plans.
- Better information provided by TAM can help community interest groups and legislators to accomplish their goals, and know whether they have accomplished them, or at least know that the agency has done its part. Quality forecasting of performance, and validation of forecasting models, can bring expectations and reality more in line with each other. They help the agency be more confident in its commitments, and more accountable for them.
- In a broader sense, opening itself up to the public through a transparent TAM process helps the public to get onboard in wishing for the agency's success, and enables them to know a success when they see it, and celebrate it.

All of the above are public benefits of TAM, helping the political process work better by means of better information and a more open set of relationships. But they also directly benefit TAM internally, helping the agency to be successful in its TAM implementation. These public benefits and relationships build a constituency and demand for better information that only TAM can provide. They give the critical outside push that an agency needs in order to improve its internal processes.

The improvement of stakeholder relationships and trust is not automatic and is not overnight. It requires persistent and sustained effort. This can be hard to achieve in an environment where political leadership and senior management are inherently changeable. Often new dynamic leaders enter an agency with the intention of “shaking it up,” but need a way of directing the shakeup toward constructive ends, of making a lasting change with long-term benefits in a limited timeframe with achievable objectives and a reasonable chance of success. Much of this guide is geared toward setting the bar at the right height.

But lasting change is not a matter of individual heroic effort by a CEO. Institutionalization of more effective management techniques requires changes in process and culture—overcoming political barriers within the agency. This is another major theme of the guide. Information is power. A performance based culture is about sharing of power, about elevating the goals of the agency in relation to the goals of the individual—teamwork—giving up some power in exchange for reduced risk, greater community support, and accomplishment of bigger goals. It is done voluntarily and is done as a group under peer pressure. To a great extent the professionals within the agency, who are in it for the long term, bear the responsibility of recognizing the opportunity and making it stick.

Case Study 1-3. Performance Commitments

In a dramatic announcement beneath the corroded span of a massive depression-era bridge, Governor Ed Wilbur joined the CEOs of 10 of the state's largest employers, to announce a 10-year, \$1.2 billion program to replace 600 bridges and thereby cut in half the inventory of 1,200 structurally-deficient bridges in his state. It was the climax of two years of work by the Governor's political staff and by the State Transportation Commissioners, to court the business community to sign on to the initiative.

This was precisely the kind of action that is supported by asset management: the ability to make specific public commitments of performance in exchange for specific amounts of money, and use this commitment to bind a coalition that can last long enough to get the job done, a coalition that can also accomplish other goals of importance to the Governor, such as re-election.

Sadly, there is a problem. While the state has excellent data on bridge condition, it has not fully implemented its bridge management system and is not able to reliably quantify deterioration rates. It turns out that the number of bridges likely to become structurally deficient in each of the next 10 years exceeds the number of bridges to be replaced each year by Gov. Wilbur's new program. In spite of the infusion of investment, the number of deficient structures would likely continue to increase, albeit at a slower rate. It would cost about twice as much as the Governor promised to accomplish the stated goal and finish the 10 year program with only 600 deficient bridges remaining.

This is one of the critical success factors in asset management: that the agency needs to take deliberate, planned steps that make progress from the top to the bottom of the organization chart. Actions such as Gov. Wilbur's are strongly encouraged and have great political payoff potential, but there is also a steep downside unless the agency is fully able to back up the commitment.

The silver lining in Gov. Wilbur's story is that the gaffe spurred a newly intense interest in completing the implementation of bridge management in the Department, to help get reality and expectations more in line with each other.

1.4.4 Life-Cycle Principles

TAM planning begins with identifying the need for assets, this being influenced by the expectations and drivers illustrated in Figure 1-3 along with the results of strategic planning, transportation planning, and other forward looking processes. When new assets need to be created, such as a new routes, additional lanes, new lighting, and so on, this is the start of the asset life cycle. Once created, the role of the agency as the asset's steward may include operating it, maintaining it, preserving it, replacing it, expanding or improving it, and possibly disposing of it altogether when it is no longer required. These activities form the entire life cycle of the asset.

There are three key principles that underpin TAM:

- Recognizing the economic value of assets
- Achieving economic efficiency and the optimization of expenditure over the asset's life cycle
- The role of the agency as "steward" of the assets

Economic Value of Assets

Most assets have a finite life, and as they age their ability to provide future service naturally declines. It is useful to describe this as the "service potential" of an asset and to characterize it in economic or investment terms. This also leads to two other important concepts—the "economic consumption" of assets and "intergenerational equity." These concepts do not attempt to address the important contribution that transportation assets make to economic prosperity or well-being, but rather, are focused on assisting an agency to understand the relative economic value and position of their asset portfolio compared to new. An agency can usefully compare a reduction in service potential of a network

in monetary terms with the rate at which it reinvests in the network through periodic treatments—preventive maintenance, rehabilitation, and replacement. Not only do these treatments improve condition and performance, but they also restore the economic value embodied in the assets. This is important to accountability and stewardship.

- **Service potential**—represents the economic benefits embodied in an asset
- **Economic consumption**—represents the loss of service potential with the passage of time
- **Intergenerational equity**—reflects the spread of economic costs and benefits of an asset evenly across the life of the asset.

Economic Efficiency and Optimization

Another key concept in both the definition and purpose of TAM relates to economic efficiency and the optimization of expenditure over the life cycle of the asset. Figure 1-5 provides a generalized perspective of the initial and ongoing costs of an asset, and the accumulated costs over the asset's life.

Each transportation asset typically has an initial construction cost, subsequent costs for refurbishment and replacement, and ongoing maintenance costs throughout its life. Costs occurring in the near-term are typically more important to the decision maker, due to the need to locate funding and to forego other possible uses of the same money. This leads to the concept of *time value of money* to quantify the inter-temporal trade-offs in the asset cost structure.

In an effort to minimize the long-term cost of any given level of service, an important asset management function is to minimize the *present value*, or total cost of the asset cost stream, recognizing the time value of money. This weighted total cost is often called *life-cycle cost*. Effective preventive maintenance activities involve a small, near-term expenditure calculated to avoid or delay a later, much larger expenditure.

Stewardship

The *AASHTO Transportation Asset Management Guide* discusses three drivers of the life-cycle approach to TAM:

- Asset management takes a long-term view of infrastructure performance and cost. Costs and benefits are assessed throughout the service life of the infrastructural asset.
- Asset management is proactive: cost effective preventative strategies are encouraged.
- Asset management is explicit and visible: among other things, asset management demystifies decision processes, fosters confidence in the allocation and utilization of scarce resources, and fosters stakeholder participation and buy-in.

Putting these together with the purpose of TAM life-cycle asset management

- Considers the costs and benefits of an asset from the time its need is identified until the need no-longer exists and the asset is decommissioned.
- Involves stake-holders and customers (or their representatives) when making decisions that affect them now or will affect them in the future, such as agreeing to levels of service and the subsequent costs.
- Requires consideration of future outcomes and not just current performance.
- Optimizes the timing of rehabilitation and replacement options.

Using this perspective, the concept of stewardship can be quantified and made a part of the measured performance of the organization.

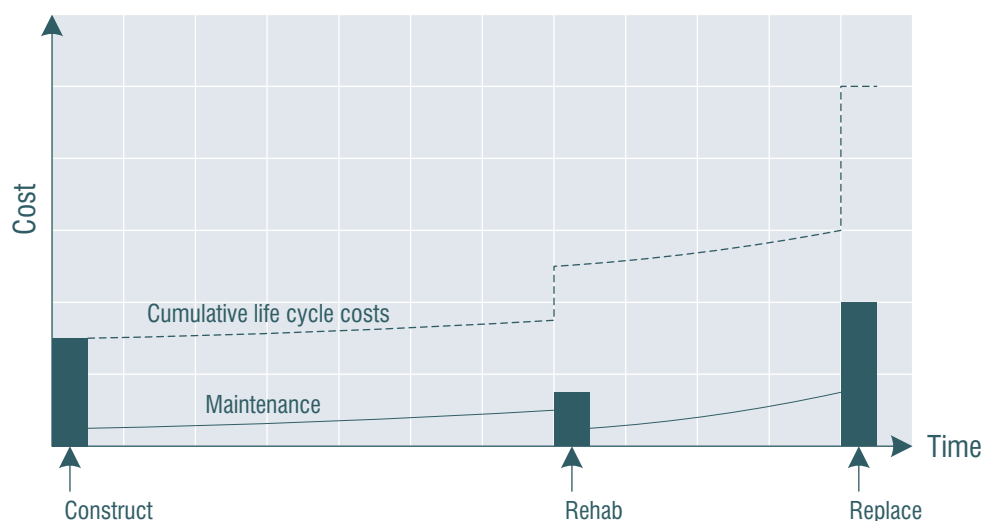


Figure 1-5. Asset Life-Cycle Costs

1.4.5 What Does Effective TAM Look Like in Practice?

There are many features that characterize TAM effectiveness in an agency, and a number of these are described below. It is also important to recognize other elements that transcend these characteristics, such as knowledge, skilled people, effective processes, good data flow, and efficient supporting technology.

Takes a Network View

A network is made up of a large number of different assets, which provide different services and have different management characteristics. However, transportation networks are synergetic. That is, the performance of the network as a whole is dependent on that of its parts and the performance of each part needs other parts to function effectively. A simple example of this is that pavements need effective drainage, and the needs of both asset groups must be managed together.

People experience the roads and highways they use as parts of broader networks, for example “the road I live on joins onto a more important road.” They expect roads and highways serving similar purposes or functions to deliver similar levels of service, to feel similar and to “not surprise them.”

Without a network view, inappropriate and unnecessarily costly methods, policies, or projects may result. For example, building a new facility where the total lifetime economic savings of the traffic it attracts are less than the life-time costs of its construction and operation. Was there really a need for the facility within the network?

Aligns with Strategic Directions

TAM must be part of the organization’s strategy and goals. In terms of business strategy, the “owners” of the business, as represented by the Transportation Commission or board of directors, must have commitment to it. As a business process the managers of the business, the CEO, and senior management team, must also have commitment to it. Effective TAM improves the ability and likelihood of achieving policy goals and objectives.

Leadership Which Aligns the Agency

Leadership is critical in integrating TAM throughout an organization. Most transportation agencies separate their business planning and delivery functions for capital and maintenance work, leading to silos of decision making where one group does not fully consider or understand the problems or concerns of the other. For example, in a bid to construct a new facility and keep the costs of construction as low as possible, the possibility of escalating

Case Study 1-4. UDOT Strategic Direction

UDOT publishes, under the signature of its Executive Director, its strategic goals for the Utah network. Dubbed the “Final Four” these “*strategic goals provide guidance in the department’s efforts to improve the quality of life and economic vitality of the state.*”^a

The Final Four and their focus areas are^b:

1) Take Care of What We Have

- a) Pavement Preservation
- b) Bridge Preservation
- c) Snow and Ice Control

1) Making the System Work Better

- a) Traveler Information
- b) Traffic Signal Coordination
- c) Incident Management
- d) Travel Demand Management
- e) Mobility

2) Improve Safety

- a) Reduce the number of fatalities on state roads
- b) Reduce Pedestrian Fatalities
- c) Public Outreach

3) Increase Capacity

- a) Adding Lanes
- b) Corridor Preservation
- c) Choke Points

These strategic directions are used to provide direction to the processes, procedures, and programs of UDOT. Progress towards achieving them is reported to the Commissioners and the public annually.

^a Quoted from the Introduction to 2006 version of “The Final Four”.

^b <http://udot.utah.gov/main/f?p=100:pg:0:::V,T::39>, visited Jul 30 09 NZDT.

maintenance costs may be overlooked or downplayed. Maintenance workers may undertake costly repairs not knowing that a major replacement or upgrade program is planned. Communication and coordination are key leadership responsibilities.

Communicates with Stakeholders

It is a truism in business that what gets measured, gets done. What is important about performance measurement is that the organization’s mission, and its achievement of the mission, can be quantified, planned, and tracked over time. A commitment to asset management is also a commitment to transparency and accountability, because asset management enables stakeholders to monitor performance in an objective manner.

Stakeholder transparency is a powerful tool in aligning the agency’s environment—especially its funding bodies—with the agency’s own plans and goals. A mature asset management process is able to inform stakeholders of the trade-offs among competing objectives and the relationship between service levels and resources. Such

communication can be used to establish constructive stakeholder relationships. In turn, the existence of such relationships will tend to perpetuate the demand for effective and credible asset management processes. It also serves to ensure that what the agency is delivering is what the stakeholders and customers want.

Makes Data-Driven, Informed Decisions

Effective TAM requires a history of good data, including knowledge about the assets, their condition, performance, and other characteristics that relate to the life of the asset and its ability to continue to provide reliable, safe service. Having the data “somewhere” is not enough, it needs to be in a form and place where it can influence decision making—whether this is about maintenance, rehabilitation, replacement, inspection, or condition assessment cycles. Understanding and systematically documenting the risks associated with assets is also a critical asset management practice. The following case study illustrates the potential consequences of gaps in knowledge about a critical asset.

Case Study 1-5. Availability and Accuracy of Data

Collapse of Bridge I-35W Mississippi River bridge (Bridge 9340)^a

On August 1, 2007, this 8-lane steel truss-arch bridge collapsed during the evening rush hour killing 13 people and injuring 145.



On January 15, 2008, NTSB Chairman Mark V. Rosenker said, “During the wreckage recovery, investigators discovered that gusset plates at eight different joint locations in the main center span were fractured. The Board, with assistance from the Federal Highway Administration (FHWA), conducted a thorough review of the design of the bridge, with an emphasis on the design of the gusset plates. This review discovered that the original design process of the I-35W bridge led to a serious error in sizing some of the gusset plates in the main truss.”

On November 13, 2008, the NTSB released the findings of its investigation into the collapse of the bridge, which stated that the primary cause was the under-sized gusset plates, at 0.5 inches (13 mm) thick. Contributing to that design or construction error was the fact that 2 inches (51 mm) of concrete were added to the road surface over the years, increasing the dead load by 20%. Also contributing was the extraordinary weight of construction equipment and material resting on the bridge just above its weakest point at the time of the collapse. That load was estimated at 578,000 pounds (262,000 kg) consisting of sand, water, and vehicles. The NTSB determined that corrosion was not a significant factor, but that inspectors did not routinely check that safety features were functional.[133]

As a result of this collapse and as soon as the potential case was evident (August 8, 2007), the FHWA advised states to inspect the 700 U.S. bridges of similar construction.

^a http://en.wikipedia.org/wiki/I-35W_Mississippi_River_bridge visited 30 July 2009.

Integrates Agency Programs and Budgets

Aligning strategies, plans, programs, and budgets is one of the steps required to ensure that the agreed levels of service are delivered to current and future customers in the most cost effective manner. The less linkage there is between these programs the less chance there is that successful delivery will be other than a coincidence.

Case Study 1-6. Integrated Programs and Budgets

Colorado DOT's commitment to asset management started in the 1990s when the agency began defining investment categories, associated performance measures, and relevant data—safety, system quality, mobility, and program delivery.

These investment categories allowed the agency to bring asset management elements into a framework that relates investments to policy objectives and impacts rather than funding sources. This approach has enhanced the agency's ability to analyze trade-offs across programs and paved the way for future TAM initiatives. These have included an updated planning and prioritization process, integration of levels of service, customer surveys, and guidance for updating technology infrastructure.

Monitors Outcomes

Monitoring of outcomes is demonstrated by agencies who regularly monitor both their agency's performance and that of the assets, and who understand whether the outcomes that are listed in strategies, programs, and plans are in fact being delivered.

Focuses on Continuous Improvement

Continuous improvement is a core feature of asset management implementation, embodied in the self assessment and gap analysis described in this guide. It is both a management approach and a feature of organizational culture.

1.4.6 TAM Evolution

The evolution of TAM in an organization is an incremental, continuous improvement process which can be guided using a self analysis approach. There are specific features of TAM that can be described in characterizing an agency at different stages of TAM evolution and these are described here.

Early Stages of TAM

The early stages of adoption of TAM practices are often characterized by simple analysis processes and documentation of existing practices and procedures. TAM at a "basic" level also meets minimum legislative and organizational requirements for financial planning and reporting and provides simple, technically based outputs to support them, such as

- describing the levels of service currently provided by the network,
- describing maintenance and preservation practices in broad outline,
- listing replacement and reconstruction programs, and
- listing expansion and new construction programs.

These four items may constitute the whole of an initial TAMP.

As TAM practices further evolve, the following features become more developed:

- Risk management, and the identification of critical assets
- Some detail of the extent and composition of the assets being managed (e.g., asset inventories)
- An assessment of current asset condition and performance, including current measurements (such as bridge condition) and a desk-top assessment of the condition of other assets by staff or operators with a good knowledge of them
- Simple benefit/cost analysis, or other satisficed decision-making analysis of asset investment options
- Longer term financial forecasts
- Improvement planning

In the early stages of asset management, each data collection and analysis process is isolated to a small portion of the agency and not known or understood outside a narrow chain of command. This condition is frequently referred to as “silo-based” asset management. In the early stages, asset management focuses on the current state of the infrastructure and lacks the ability to evaluate how policies and programs might change system performance.

Advancing TAM Practice

Movement through the maturity levels of TAM practice is part of continuous improvement. An agency at a more advanced TAM level should demonstrate the following characteristics:

- Asset management practices and objectives will be clearly derived from the corporate strategic plan.
- The corporate strategic plan will be developed from sound knowledge of current and future customers’ needs, wants, and expectations.
- Measures of achievement of mission goals and objectives are quantitative, have written definitions, and are uniform across the agency.
- There are long-term, life-cycle management plans for each asset group and for some individual assets. These plans show the projected outcomes of policies and programs in terms of cost, performance, and risk.
- Asset performance measures are aligned with the corporate direction.
- Information technology systems required to support asset management processes are integrated with those processes; are appropriate, used, and understood; and integrate with corporate information platforms, avoiding duplication of effort, and data.
- Program management practices make use of appropriate predictive methods and optimized decision-making techniques to identify the actions required to deliver the agreed levels of service.
- Corporate financial plans are derived from the Asset Management Plan and these links are clear and easily followed.
- The process of continuous improvement is entrenched and evident.

This guide intends to provide a roadmap for the journey toward greater asset management maturity.