

AMERICAN ASSOCIATION
OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS

AASHTO



2nd
EDITION

AASHTO Transportation Asset Management Guide

A FOCUS ON IMPLEMENTATION

2020

Acknowledgments

This study was conducted as part of National Cooperative Highway Research Program (NCHRP) Project 08-109. NCHRP is supported by annual voluntary contributions from the state departments of transportation (DOTs). The work was guided by an NCHRP project panel and managed by Dr. Andrew Lemer, NCHRP Senior Program Officer.

The contributions of the Arkansas, Arizona, California, Colorado, Connecticut, Florida, Georgia, Indiana, Iowa, Kansas, Maine, Michigan, Minnesota, Montana, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio, Oregon, Oklahoma, Pennsylvania, South Dakota, Tennessee, Utah, Virginia, Washington, D.C., Washington State, and Wyoming Departments of Transportation as well as the Kentucky Transportation Cabinet, Vermont Agency of Transportation, the Federal Highway Administration, and numerous other transportation agencies are acknowledged with thanks.

Special thanks goes to Spy Pond Partners, LLC; Applied Pavement Technology, Inc.; and WSP for preparation of this document.

Disclaimer

The opinions and conclusions expressed or implied in this report are those of the research agency and are not necessarily those of the Transportation Research Board, the National Research Council, or the program sponsors. This document has not been reviewed or accepted by the Transportation Research Board Executive Committee or the National Academies of Sciences, Engineering, and Medicine; and has not been edited by the Transportation Research Board.

© 2020 by the American Association of State Highway and Transportation Officials. All Rights Reserved. This book, or parts thereof, may not be reproduced in any form without written permission of the publisher. Printed in the United States of America.

ISBN: 978-1-56051-763-4

Publ. Code: TAMGFI-2

AASHTO Executive Committee

2020–2021

OFFICERS:

PRESIDENT: Victoria F. Sheehan, New Hampshire*

VICE PRESIDENT: Shawn D. Wilson, Ph.D., Louisiana*

SECRETARY-TREASURER: Russell McMurray, Georgia*

EXECUTIVE DIRECTOR: Jim Tymon, Washington, DC

REGIONAL REPRESENTATIVES:

REGION I: Joe Giulietti, Connecticut
Marie Therese Dominguez, New York

REGION II: Kevin Thibault, Florida
Vacant

REGION III: Craig Thompson, Wisconsin
Julie Lorenz, Kansas

REGION IV: James Bass, Texas
Bill Panos, North Dakota

IMMEDIATE PAST PRESIDENT: Patrick McKenna, Missouri

*Elected at the 2020 Virtual Annual Meeting

AASHTO Committee on Performance-Based Management 2020–2021

Timothy Henkel, Minnesota DOT, Chair
Christos Xenophontos, Rhode Island DOT, Vice Chair
Karen Miller, Missouri DOT, Secretary
Matthew Hardy, AASHTO

Edward Austin, Alabama	Jason Chapman, Louisiana	Tim McDonald, Ohio
Carolyn Morehouse, Alaska	Andy Bickmore, Maine	Matt Swift, Oklahoma
Brad McCaleb, Arkansas	Karuna Pujara, Maryland	Phil Kase, Oregon
Michael Johnson, California	Meredith Hill, Maryland	Christos Xenophontos, Rhode Island
William Johnson, Colorado	Rachel Bain, Massachusetts	Lori Fiset, Rhode Island
Edgardo Block, Connecticut	Brad Wieferich, Michigan	Brent Rewis, South Carolina
Shanté Hastings, Delaware	Ed Idzorek, Minnesota	Mike Behm, South Dakota
John Thomas, District of Columbia	Billy Owen, Mississippi	Paul Degges, Tennessee
Regina Colson, Florida	Karen Miller, Missouri	Beverly West, Texas
Joshua Waller, Georgia	Jim Skinner, Montana	Nathan Lee, Utah
Scot Urada, Hawaii	Ryan Huff, Nebraska	Chad Allen, Vermont
Travis McGrath, Idaho	Tracy Larkin-Thomason, Nevada	Jay Styles, Virginia
Holly Bieneman, Illinois	Nick Alexander, New Hampshire	Daniela Bremmer, Washington State
Louis Feagans, Indiana	Michael Russo, New Jersey	Gehan Elsayed, West Virginia
John Selmer, Iowa	Tamara Haas, New Mexico	Jacquelyn Irving, Wisconsin
Lindsey Douglas, Kansas	Ehren Meister, North Carolina	Martin Kidner, Wyoming
Jason Siwula, Kentucky	Jack Smith, North Dakota	

AASHTO Subcommittee on Asset Management 2020–2021

Matthew Haubrich, Iowa DOT, Chair
Anne-Marie McDonnell, Connecticut DOT, Vice Chair
Matthew Hardy, AASHTO

Carolyn Morehouse, Alaska	Mark Suarez, Louisiana	Steve Wilcox, New York State
Brad McCaleb, Arkansas	Karuna Pujara, Maryland	Dawn Sullivan, Oklahoma
Michael Johnson, California	Patricia Leavenworth, Massachusetts	Tom Prestash, Pennsylvania
William Johnson, Colorado	Craig Newell, Michigan	Kevin Gantt, South Carolina
Anne-Marie McDonnell, Connecticut	Tim Henkel, Minnesota	Paul Degges, Tennessee
Jim Pappas, Delaware	Karen Miller, Missouri	Nathan Lee, Utah
Regina Colson, Florida	Lynn Zanto, Montana	Chad Allen, Vermont
Laura Heckel, Illinois	Anita Bush, Nevada	Todd Lamphere, Washington State
Louis Feagans, Indiana	Danielle Graves, New Jersey	David Vieth, Wisconsin
Matthew Haubrich, Iowa	Phillip Montoya, New Mexico	Martin Kidner, Wyoming

Table of Contents

Chapter 1. Introduction	1-1
TAM Basics	1-4
What Is TAM?	1-5
Definitions	1-6
TAM Principles	1-8
TAM Elements	1-10
<i>Basic Requirements Checklist</i>	<i>1-12</i>
About This Guide	1-13
Scope and Organization	1-14
Intended Audiences: Who Should Use This Guide?	1-17
Ways to Use This Guide	1-18
TAM Resources	1-20
Frameworks and Guidance	1-21
Legislation and Regulations	1-24
Assessment Tools and Maturity Models	1-25
Communities	1-26
Chapter 1. References	1-28
Chapter 2. TAM Strategy and Planning	2-1
Developing a TAM Strategy	2-4
Integrating TAM within Agency Strategic Plans and Policies	2-5
Creating a TAM Policy	2-6
<i>Develop an Asset Management Policy</i>	<i>2-10</i>
TAM Integration	2-12
Planning and Programming	2-13
Performance Management	2-15
Risk Management	2-19
<i>Develop a Risk Register</i>	<i>2-22</i>
Information Management	2-24
TAM Assessment and Advancement	2-27
Assessing Current Practice	2-28
Defining and Prioritizing Improvement in TAM Approaches	2-31
<i>Prioritize Assets for TAM Advancement</i>	<i>2-33</i>
Developing a TAM Implementation Plan	2-34
Monitoring TAM Program Improvements	2-38
Developing a Transportation Asset Management Plan (TAMP)	2-40
The Basic TAMP	2-41
Beyond the Basic TAMP	2-44
Chapter 2. Maturity Scale	2-46
Chapter 2. References	2-47

Chapter 3. Organization and People	3-1
Establishing TAM Roles, Responsibilities, and Competencies	3-4
Organizational Models	3-5
TAM Roles	3-11
<i>TAM Roles</i>	3-16
Competencies	3-17
<i>Recruit Individuals for Asset Management Roles</i>	3-19
Strengthening Coordination and Communication	3-20
Internal Coordination	3-21
<i>Establish a TAM Steering Committee</i>	3-23
External Coordination	3-24
Communication	3-26
<i>Develop a Communications Plan</i>	3-30
Managing Change	3-32
TAM Culture	3-33
Understanding the Organization	3-34
TAM Change Readiness	3-37
<i>Assessing an Organization's Change Readiness</i>	3-39
<i>Manage Change and Prepare for a System Replacement</i>	3-40
Chapter 3. Maturity Scale	3-42
Chapter 3. References	3-44
Chapter 4. Asset Performance	4-1
Introduction to Life-Cycle Management	4-4
Defining Life-Cycle Management	4-5
Defining Asset Service and Performance Levels	4-10
<i>Establish Customer-Based, Service-Level Targets</i>	4-15
Developing Life-Cycle Strategies	4-18
Common Life-Cycle Management Approaches for Transportation Assets	4-22
Life-Cycle Management Approaches	4-23
Selecting the Right Management Approach	4-25
Managing Assets over Their Life Cycles	4-28
Managing Assets Using Condition-Based Management	4-29
<i>Life-Cycle Planning for Pavements</i>	4-35
Applying Other Life-Cycle Management Approaches	4-36
Implementing Life-Cycle Management	4-39
<i>Determining What Data Is Needed to Support Life-Cycle Management</i>	4-43
<i>Considerations to Support the Successful Implementation of a Life-Cycle Approach to Managing Assets</i>	4-46
Chapter 4. Maturity Scale	4-48
Chapter 4. References	4-50

Chapter 5. Resource Allocation	5-1
Resource Allocation and Prioritization	5-4
What Is Resource Allocation?	5-5
Transportation Agency Context	5-6
Prototypical Resource Allocation Process	5-8
Consideration of Risk in Resource Allocation	5-13
Cross-Asset Resource Allocation	5-17
Challenges in Cross-Asset Resource Allocation	5-18
Use of Performance Targets to Support Cross-Asset Resource Allocation ..	5-20
Use of Multi-Objective Decision Analysis for Resource Allocation	5-23
<i>Implementing a Multi-Objective Decision Analysis (MODA) Approach</i>	5-25
<i>Considerations in Implementing a Multi-Objective Allocation Approach</i> ..	5-26
Financial Planning	5-29
TAM Financial Plan	5-30
Implications for Resource Allocation	5-32
<i>Preparing a TAM Financial Plan</i>	5-34
Work Planning and Delivery	5-36
TAM Work Planning and Delivery	5-37
Implications for Resource Allocation	5-39
<i>Work Planning and Delivery</i>	5-41
Chapter 5. Maturity Scale	5-42
Chapter 5. References	5-43
Chapter 6. Monitoring and Adjustment	6-1
Monitoring Performance Measures	6-4
Selecting and Using Performance Measures	6-5
<i>Characteristics of Strong Performance Measures</i> <i>for Managing the Condition of Ancillary Assets</i>	6-14
Evaluating the Effectiveness of Performance Measures	6-15
<i>Benchmark Performance</i>	6-18
Monitoring the State of Assets	6-19
Types of Performance-Based Data to Monitor	6-20
Maintaining Asset Data	6-22
Monitoring Funding and Resource Allocation Trends	6-23
Types of Funding and Resource Allocation Trends	6-24
Using Trend Data to Make Program Adjustments	6-27
Monitoring Asset Work and Costs	6-30
Importance of Tracking Work Activities and Treatment Costs	6-31
Establishing Business Processes to Support Work History and Cost Tracking	6-33
Using Work History Data to Improve Models	6-34
Monitoring Risks and TAM Processes	6-38
Monitoring and Managing Risks	6-39

<i>Monitoring External Risks</i>	6-41
Monitoring TAM Processes and Improvements	6-42
Managing Implementation Responsibilities and Processes	6-44
<i>Risk Management Process</i>	6-49
<i>Use RACI to Create a Responsibility Assignment</i>	6-50
Chapter 6. Maturity Scale	6-51
Chapter 6. References	6-53
Chapter 7. Information and Systems	7-1
TAM Information Integration	7-4
TAM Data and Systems	7-5
Why Integrate?	7-10
Planning for TAM Information Integration	7-12
<i>Data Items to Standardize for TAM</i>	7-16
Integrating Asset Information Across the Life Cycle	7-17
Collecting Asset Data	7-19
Deciding What Data to Collect	7-20
How to Collect Data	7-23
Preparing for Data Collection	7-25
<i>Asset Data Collection Readiness Checklist</i>	7-27
Asset Data Sharing, Reporting, and Visualization	7-29
Designing Effective Reports and Visualizations	7-30
Data Sharing	7-33
Preparing Data for Sharing, Reporting, and Visualization	7-36
Data Governance and Management	7-38
Fundamental Concepts and Principles	7-39
Data Governance Practices Supporting TAM	7-41
Assessing Data Management and Governance Maturity	7-43
Chapter 7. Maturity Scale	7-47
Chapter 7. References	7-48

●○○
Section 1.1
TAM Basics

●●○
Section 1.2
About This Guide

●●●
Section 1.3
TAM Resources

●○○○○○
Chapter 1
Introduction



Section 1.1

TAM Basics

covers the definitions used throughout the guide and discusses the high-level principles, elements, and benefits of good TAM practice.



Section 1.2

About This Guide

provides an overview of the organization and features of the guide.



Section 1.3

TAM Resources

provides a brief summary of the resources used throughout the guide and indicates how to access the resources.



Chapter 1 Introduction

Welcome to the Transportation Asset Management (TAM) Guide. Whether you are new to asset management, a seasoned practitioner or an executive, this guide will help to further your understanding of asset management techniques and advance asset management practices at your agency.

TAM is a way of conducting a transportation agency's business to deliver more value in its activities so that the transportation system performs best with the available resources. Most agencies have elements of TAM principles in their existing practice. This guide can help with formalizing TAM practice, identifying areas for improvement, and understanding how to improve. Some of the benefits of TAM include:

- **Improved asset condition, performance, resilience, and longevity.** Asset management involves maintaining the asset condition over the asset's lifetime. Improved condition results in improved performance and ultimately extends the life of an asset compared to the alternative of continually deferring maintenance.
- **Improved accountability.** When asset management practices are embedded in an agency, staff are held accountable within the agency and to customers and stakeholders to follow TAM practices and consistently maintain the assets in a state of good repair. Preparing an asset management plan also ensures accountability by providing reliable information about the condition of assets.

- **Increased efficiency and effectiveness.** When assets are managed following an agreed-upon management strategy, efficiency and effectiveness are improved. Regular maintenance can be planned and scheduled, reducing disruption to service as little as possible.
- **More benefit for each dollar invested.** Transportation assets 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.
- **Reduced risk exposure.** When assets are maintained and managed consistently and resilience is improved, the agency reduces the exposure to risk.
- **Improved coordination and efficiency.** Asset management helps potential silos within an agency by improving resource allocation and improving coordination among staff on asset management related projects and maintenance.