Introduction

This chapter provides an overview of the guidebook and presents its purpose, scope, and organization.

Background

State departments of transportation (DOTs) have made steady progress in the use of data and information systems to manage transportation assets. Advances in data acquisition, management, and reporting tools and technologies are enabling more automated, efficient, and integrated flows of data across systems and more agile and effective ways of delivering information needs to end-users.

DOTs have strong incentives to take advantage of these advances; they face growing expectations from the public, increasing demand for transparency and accountability, and challenges to make the best use of limited resources to deliver value.

This guidebook provides step-by-step techniques and a digital tool to:

- Assess current practice and establish a desired state,
- Identify and evaluate data- and information system-related improvements, and
- Secure agency support for improvements and plan an implementation strategy.

> **Institutional challenges** faced by transportation agencies in effectively and sustainably advancing how information is managed, shared, and used within and across organizations require much more than procuring new tools and technologies. In recognition of these challenges, this guidebook identifies **organizational capabilities and typical strategies** which will help DOTs accelerate and implement cross-functional and enterprise-wide changes to how data are collected, managed, shared, and used in their TAM-related programs.

Transportation Asset Management is defined by the American Association of State Highway and Transportation Officials (AASHTO) as 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 and Scope

The purpose of this guidebook is to assist DOTs in advancing the use of data and information systems for transportation asset management (TAM). It is intended to be used in conjunction with a companion digital tool, the TAM Data Assistant, providing a comprehensive way to benchmark agency practices and identify and evaluate improvements.

Guidebook Purpose

TAM is by nature data- and analysis-intensive. Data (and information derived from data) about asset inventory, condition, performance, and related work activities are used to inform agency strategies for maintenance, rehabilitation, and improvement. Data also inform the allocation of increasingly scarce resources.

Most transportation agencies have asset management systems in place and use a variety of systems to plan and track maintenance activities and capital projects. However, they face challenges with integrating data across systems and across the asset life-cycle. Agencies also seek to capitalize on opportunities to adopt new, emerging tools and technologies for data collection and analysis.

This guidebook provides a structured approach that agencies can use to assess current practices in the use of data and information for TAM. This approach can be applied comprehensively; it can be targeted for a particular asset, or it can focus on a particular topic area such as data collection or data integration.

A companion digital tool, the TAM Data Assistant (available at www.dataassessment. tam-portal.com), can facilitate conducting the assessment, identifying improvements, and evaluating candidate improvements. This guidebook is intended to be used initially to help agencies plan and organize an assessment. It also provides supplemental resources that can help agencies with each step of the process—understanding the context for each of the assessment elements, learning about and evaluating possible improvements, and planning an implementation strategy.

Guidebook Scope

The guidebook is structured around a data life-cycle framework. This life-cycle (illustrated in **Figure I-1**) consists of five essential steps for making efficient and effective use of data and information for TAM. The data life-cycle approach was selected to reinforce the importance of anticipating how data will be used before collecting it. The data life-cycle can be viewed as a supply chain in which the finished product is a data-informed decision. Getting a quality product depends on sound practices for specifying data, collecting it, storing and integrating it, providing access to potential users, and having suitable analysis tools and processes in place.

Each step of the data life-cycle represents an *assessment area* (area) in the guidebook. For an overview of each area, see the text box titled "Technical Framework." Further details are provided in Chapters 2 and 3.

Figure I-1.   Guidance framework.

For each area, the guidebook provides *benchmark levels* (modeled levels described by the research) and *candidate improvements*. The benchmarks describe levels of practice representing a trajectory for advancement from a nonexistent or minimal practice to a more sophisticated practice. The candidate improvements describe initiatives that agencies can pursue to move from one benchmark level to the next.

The guidebook provides two types of supplemental resources to help agencies select and plan improvements:

- *Case studies,* which provide examples of implementation experience; and
- *Organizational practice* descriptions, which highlight approaches that can be taken to overcome the very real challenges of implementing data and information improvements.

Technical Framework

Data Life-Cycle Area Overview

Specify and Standardize Data

Supports the understanding of the needs and full costs of asset inventory, condition and performance, treatment, and work history data. Also addresses the documentation of data meaning, derivation, and quality, and the establishment of governance structures and processes and stewardship roles and responsibilities.

Collect Data

Explores TAM-related data collection processes, tools and technologies, and quality as delivered with respect to existing data standards.

Store, Integrate, and Access Data

Addresses data availability across the enterprise and the elimination of redundant and duplicative data. Specific asset life-cycle process areas are identified for data standardization and integration, as well as other data and process areas important to TAM decision-making.

Analyze Data

Examines decision-support tools, techniques, and practices that facilitate development of actionable information and insights supporting decision-making. Data exploration, reporting, visualization, and asset modeling are a focus within this area.

Act Informed by Data

Covers data-informed TAM practices, exploring asset life-cycle management through resource allocation and prioritization, project planning, scoping and design, and maintenance decision-making.

Anticipated Uses

The guidebook is intended to be used to carry out a formal assessment and improvement planning effort. However, it can also be used as a resource for DOTs that are not ready to pursue an assessment process but are interested in what they can do to improve their practices. Formal applications of the guidance would involve selecting a focus area, forming a team, using the

companion tool to carry out the assessment, and then producing a plan for improvements. Informal or individual uses of the guidance could involve using the guidebook as a reference for individual agency managers or TAM practitioners to understand possible future directions for advancement, review case studies, and provide ideas for evaluating improvement strategies.

Intended Outcomes

Completing the full assessment process will result in:

- A shared understanding of current agency practice (e.g., as measured using benchmark levels) and a shared vision for how the agency wants to advance (e.g., as measured by targeted benchmark levels);
- A list of candidate data and information system-related improvements that could be used to close the gaps between current and target practice levels; and
- A prioritized list of improvements that have been created based on a systematic process of evaluating the likely impacts against the effort required and the implementation challenges.

Intended Audience

This guidebook is targeted at state DOT asset managers, business leads, system owners, and stewards who are interested in evaluating and improving how data and information systems are used within their TAM programs. Although state DOTs are the primary intended audience for the guidance, it is also applicable to other transportation asset owners (e.g., transit agencies).

To fully realize the benefits of the assessment, other business, technical, and supporting functions should be involved in the process, including:

- Field asset management staff;
- Information technology (IT) managers;
- Business intelligence and geographic information system (GIS) managers; and
- Workforce, human resource, and organizational change-management leads.

TAM Data Assistant

TAM Data Assistant: Overview
Chapter 2

TAM Data Assistant and Improvement Evaluation
Chapter 4

TAM Data Assistant and Executive Communication
Chapter 4

Facilitator Materials
Appendix H

TAM Data Assistant Quick Reference Guide
Appendix I

The TAM Data Assistant

Agencies can use an electronic tool like the TAM Data Assistant to conduct the assessment. This tool supports benchmarking of an agency's current and desired practice levels, improvement identification and evaluation, and creation of a results summary and communication.

Although this guidebook contains all of the materials needed to carry out the assessment process, use of the TAM Data Assistant is strongly recommended because the tool will streamline workflow and provide summary materials useful in communicating and engaging with agency executive management or other decision-makers. A brief overview of the TAM Data Assistant functions is provided in Chapter 2. Chapter 4 details TAM Data Assistant uses supporting improvement evaluation, results summary, and executive communication, and Appendix H provides uses of the TAM Data Assistant to facilitate the complete assessment process. Appendix I contains a quick reference guide that explains the functionality and use of the TAM Data Assistant in greater detail.

Relationship to Other Guidance

This guidebook provides a comprehensive perspective on data and information system use in TAM; however, other related assessment and guidance products are available. These products include:

- The AASHTO Transportation Asset Management Gap Analysis Tool (part of the "TAM Portal"), developed under National Cooperative Highway Research Program (NCHRP) Project 08-90.
- Various data management self-assessment tools, developed under NCHRP Project 08-92 and made available for download from TRB's report webpage for NCHRP Report 814: Data to Support Transportation Agency Business Needs: A Self-Assessment Guide.
- The FHWA Transportation Performance Management (TPM) Self-Assessment Tool.
- NCHRP Research Report 920: Management and Use of Data for Transportation Performance Management: Guide for Practitioners, which provides guidance on management and use of data for Transportation Performance Management.

This guidebook and the TAM Data Assistant complement these existing tools by providing an in-depth look specifically at how data and information systems are applied to TAM practice.

Guidebook Organization

This guidebook is organized to help agencies step through the process of preparing for an assessment, conducting an assessment, evaluating improvements, and planning for implementation.

The self-assessment and improvement identification materials are organized in a three-level hierarchy:

- **Areas,** representing each phase of the data life-cycle (e.g., data collection);
- **Sections,** representing topics relevant to a data life-cycle phase (e.g., asset inventory, condition and performance data collection); and
- **Elements,** representing items for benchmarking and improvement (e.g., asset inventory, condition, and performance data quality).

The five chapters of the guidebook constitute the remainder of Part I of this guidebook. The technical appendices that supplement the guidebook are provided in Part III of this report.

- **Chapter 1: Introduction.** This chapter has described the purpose, scope, and target audience for the guidebook and provided an overview of the assessment process.
- **Chapter 2: Pre-Assessment Preparation.** This chapter helps prepare an agency for conducting an assessment. It covers selecting a focus area, assigning a facilitator, and engaging the most suitable participants. Chapter 2 also reviews the steps for conducting the assessment and selecting and evaluating improvements.
- **Chapter 3: Self-Assessment and Improvement Identification.** This chapter provides guidance and links to resources that can be useful as participants assess current practices and select improvements. The content in Chapter 3 is organized around the five areas representing data life-cycle phases.
- **Chapter 4: Evaluation and Summary of Results.** This chapter provides guidance that can be used as participants evaluate candidate improvements, set priorities, and develop materials for gaining executive support for improvements.
- **Chapter 5: Implementation Support.** This chapter describes additional resources that can be used to support the implementation of data and information system-related improvements. Such resources include case studies of DOT practice and resources about general organizational practices (such as change management).