Executive Summary
Chapter 1
Introduction

This chapter introduces asset valuation concepts and describes the organization of the guide.

What's Important

Determining the value of a transportation organization's physical assets is important for both financial reporting and transportation asset management (TAM). In financial reporting, determining asset value is a fundamental step in preparing a balance sheet for financial statements. This helps inform regulators and investors. For TAM, presenting data on the value of physical assets, such as pavement, bridges, and facilities, communicates what an organization owns and what it must maintain. This helps inform government leaders and taxpayers. Furthermore, information about asset value and how it is changing can help establish how the organization is maintaining its asset inventory and helps support investment decisions.

How the Guide Can Help

The purpose of this guide is to detail how to calculate asset value and use it to support application in TAM. This guide is designed for use by all U.S. public agencies managing transportation assets, including state and local DOTs, transit agencies, port authorities, airport operators, and others.

Spotlight on Asset Valuation Requirements

Calculating asset value for TAM is not simply good practice; it is also required of state Departments of Transportation (DOT) by Federal regulations. Title 23 of the Code of Federal Regulations (CFR) Part 515 details requirements for State DOTs to develop a risk-based Transportation Asset Management Plan (TAMP).

These regulations, initiated by the legislation Moving Ahead for Progress in the 21st Century (MAP-21), include a requirement for DOTs to calculate the asset value for National Highway System (NHS) pavement in their state. DOTs must also determine the cost required to maintain the value of their NHS assets.

To comply with the Government Accounting Standards Board (GASB) Statement 34, agencies also record their assets' book value in annual financial reports. GASB 34 allows for either a standard (i.e., historic cost with straight-line depreciation) or modified approach. Many agencies struggle to reconcile financial asset valuation for GASB reporting with asset valuation for the purposes of asset management and the TAMP.

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Chapter 2

Asset Valuation Framework

This chapter defines asset value and provides a framework for interpreting what value represents. It also relates asset value to both TAM and relevant accounting standards, and presents the basic steps in calculating asset value.

What's Important

Before practitioners can apply asset valuation to their TAM programs, they must first understand asset value's many applications and perspectives. An agency may use the cost perspective, the market perspective, the economic perspective, or a combination of all three where it fits best. Regardless of the method selected, a common set of steps is defined for calculating value.

How the Guide Can Help

There is no one right way to calculate asset value – the best approach to use depends on agency's perspective on what value represents, how the results of the value calculation will be used, and what data an agency has available. The guide presents a structured approach for considering these issues, and presents a calculation process that supports different perspectives and approaches.

Spotlight on the Asset Value Calculation Steps

The process for calculating asset value includes six basic steps. The steps are the same regardless of the specific application one has for calculating value, and regardless of whether value is based on a cost, market or economic perspective. The steps explicitly acknowledge the different applications and perspectives, and they walk the analyst through the key decisions for calculating asset value.

1 Define the Analysis Scope 2 Establish Initial Value 3 Determine Treatment Effects 4 Calculate Depreciation 5 Calculate Value and Supporting Measures 6 Communicate and Apply the Results

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Chapter 3

Asset Value Scope

This chapter describes how to establish the primary application of the asset value calculation and establish an asset hierarchy to use for the asset value calculation. It discusses issues related to data availability and quality, as well as options for making value calculations at an asset or component level.

What's Important

The first step in calculating asset value is to establish the scope of the calculation. To do this it is important to determine the primary use of the asset value calculation for supporting TAM. From there it is necessary to review the data available to support calculating asset value, determine what assets and systems to include, and establish whether it is necessary to perform the value calculation for asset components.

How the Guide Can Help

Carefully considering the scope of the asset value calculation helps ensure that the calculation is achievable, and that the results will best support an agency's needs. The guide discusses major drivers for calculating asset value to support TAM, and recommends approaches to consider for each step in the value calculation process based on the asset value driver. Also, it describes common approaches to structuring an asset hierarchy, and when an agency may want to perform the asset value calculation at a component level.

Spotlight on Asset Components

For some TAM applications one may wish to perform a more detailed calculation of asset value by determining value by asset component. An asset that is commonly represented using components is a bridge. In many cases agencies have calculated value separately for the bridge deck, superstructure and substructure, as these components have different service lives and may be rehabilitated at different times.

Bridge Deck

Superstructure

Substructure
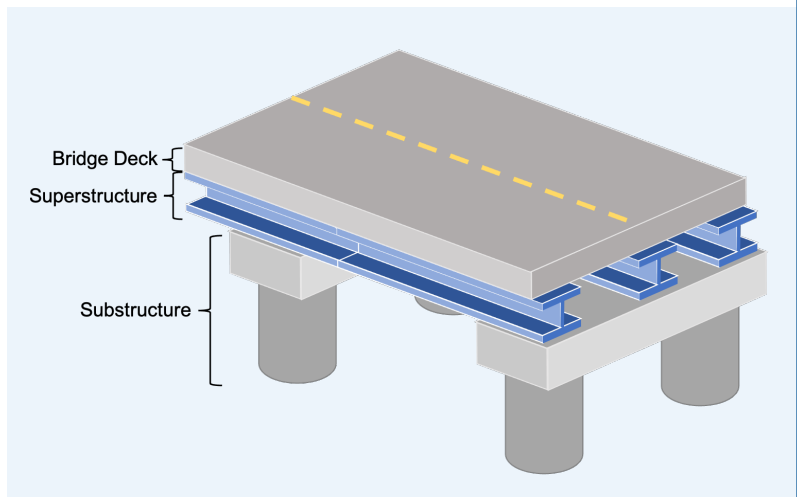
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Chapter 4

Initial Asset Value

After establishing the scope of the asset value calculation, the next step is to determine the initial asset value. Four different methods may be applied: replacement cost, historic cost, market value, and economic value.

What's Important

Initial asset value, the value of an asset at the start of the analysis period, is a key component of the asset value calculation. What this represents, exactly, depends on the approach being used to make the calculation. In some cases, the initial value is the value of an asset when first constructed or acquired, while in others, it may be the value at a particular point in time.

How the Guide Can Help

This guide describes four basic approaches to calculating initial value and provides guidance on selecting one of these approaches. The approaches include:

- **Current Replacement Cost –** the cost of replacing the asset with its modern equivalent in today's dollars.
- **Historic Cost –** the actual cost paid to first construct or acquire the asset, expressed in year of expenditure dollars.
- **Market Value –** the price of an asset if offered for sale in a competitive market. This value can be established only if such a market exists.
- **Economic Value –** the present value of the benefits of an asset to the asset's owner, and asset users.

Spotlight on Current Replacement Cost

For many TAM applications the recommended approach for calculating initial value is to use an asset's current replacement cost. The guide describes six basic steps for calculating current replacement cost:

Step 1. Determine Units of Measure

Step 2. Collect Data on Replacement Costs

Step 3. Adjust Costs for Inflation

Step 4. Determine How to Group Assets

Step 5. Calculate Unit Costs for Each Group

Step 6. Apply Unit Costs

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Chapter 5

Treatment Effects

This chapter describes the evaluation of treatment effects. This supports determining various parameters needed for the asset value calculation.
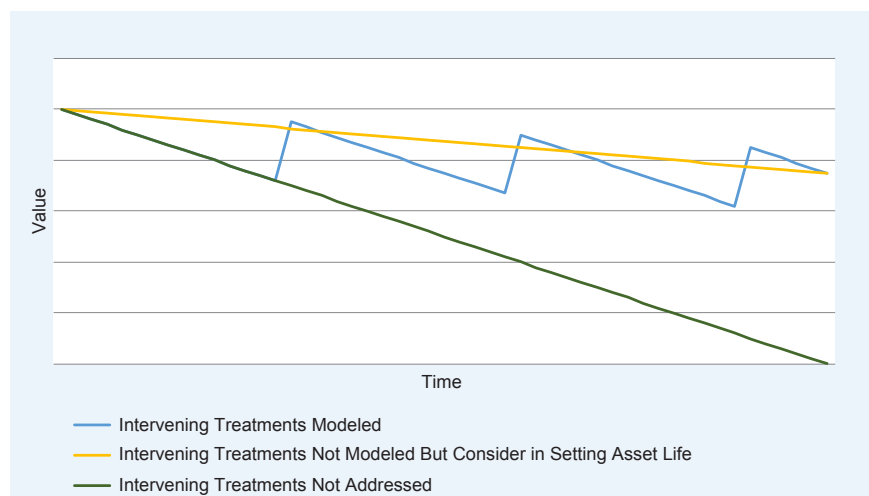
What's Important

Treatments are the activities performed on an asset over its life. One must consider what treatments may occur over the life of an asset, and whether any treatments besides the initial acquisition or construction of an asset need to be explicitly considered in the asset value calculation. For each type of treatment that is explicitly considered in the calculation one must establish the treatment's cost and effects.

How the Guide Can Help

The guide describes when it is necessary to explicitly account for different treatments in the asset value calculation and when doing this is not necessary. Also, it describes how treatment assumptions may impact the asset's useful life and residual value, or value of the asset once it has reached its useful life.

Spotlight on Treatment Assumptions

Considering treatment effects in some manner is particularly important for complex assets such as pavement and bridges which are periodically renewed. The jagged line in the figure below shows asset value if renewal treatments are explicitly modeled: these add value and add life to the asset. The straight upper line shows how asset value is calculated if the effect of renewal treatments is approximated through a revised estimate of asset life. In this case, asset treatments are not explicitly modeled. The lower line is demonstrably incorrect. In this case, renewal treatments are not modeled, but the asset life has not been modified to account for these treatments. This results in systematic understatement of asset value.

— Intervening Treatments Modeled
— Intervening Treatments Not Modeled But Consider in Setting Asset Life
— Intervening Treatments Not Addressed

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Chapter 6

Depreciation

This chapter describes how to calculate depreciation of asset value. It describes the different approaches to making the calculation, provides guidance on selecting an approach, and presents the steps for applying each approach.

What's Important

Depreciation, or loss of value over time, represents the consumption of an asset's benefits over its useful life. Three approaches are presented here for calculating depreciation. The most straightforward approach is to represent depreciation as a function of asset age using a simple linear relationship. Where condition data are available, it may be preferable to supplement or replace asset age with a calculation of effective age based on condition. A third approach is to analyze the pattern benefit consumption to establish a non-linear calculation of depreciation.

How the Guide Can Help

This guide describes the different approaches to calculating depreciation and provides guidance on selecting an approach. Also, it outlines cases where making the calculation is not necessary, such as when the initial value of the asset has been established using a market value that accounts for past depreciation.

Spotlight on Using Condition to Calculate Depreciation

Where condition data are available, it is generally preferable to use this data to calculate depreciation. The most straightforward approach to using condition data is to map conditions to effective age using the following steps:

Step 1. Map Asset Condition to Effective Age

Step 2. Compile Data

Step 3. Determine Effective Age

Step 4. Calculate Depreciation

An alternative approach is to perform a supplemental analysis to establish how the pattern of consumption of asset benefits varies based on conditions. In this case depreciation may follow an accelerate pattern, in which value depreciates more rapidly when an asset is first constructed, or a decelerate pattern in which value declines more gradually initially, accelerating as the asset deteriorates.

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Chapter 7

Measure Calculation

This chapter describes how to combine the parameters established in previous steps to calculate asset value for an asset or group or assets. Also, it describes how to calculate additional measures related to asset value, and discusses issues in comparing the calculation of asset value prepared to support TAM with that prepared for financial reporting.

What's Important

Once one has established all of the parameters for the asset value calculation, the task remains to calculate value for individual assets or groups of assets. Where the calculation is made for groups of assets, it is important to review the assumptions, and may be necessary to define subgroups of assets. In addition to calculating overall value, one may calculate other supporting measures, such as the cost to maintain value, asset sustainability ratio, asset consumption ratio, and others.

How the Guide Can Help

The guide details issues in making the asset calculation for groups of assets, and discusses the nuances in comparing asset value calculations for TAM and financial reporting. The recommended guidance for TAM is to utilize current replacement cost and condition data for most applications, while in the U.S. financial reporting is often based on historic costs and age-based depreciation. Various measures related to asset value can supplement the calculation and support decision-making. The guide provides definition and calculation guidance for a variety of measures.

Spotlight on Asset Sustainability Ratio

The Asset Sustainability Ratio (ASR) is the ratio of annual asset expenditures to the cost to maintain current value. The measure has been in use in Australian financial reporting since the early 2000's. ASR is a valuable measure for summarizing trends in asset spending. It can help identiy areas where more spending is needed to maintain value. Also, given ASR is a somewhat standardized measure, one can use it to compare asset maintenance methods and asset condition across different systems, assets and agencies. In using ASR, it is important to be clear about which costs are included in the calculation of current expenditures and the cost to maintain current value. For instance, while the cost to maintain value may be approximated based on annual depreciation, use of an agency's management systems is recommended for obtaining a more accurate value.

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Chapter 8

Using Asset Value to Support TAM Decisions

This chapter details different applications of asset value for supporting TAM. It describes the use of value-related measures, and presents a set of practical examples of TAM applications.

What's Important

Once calculated, asset value and related measures can support a range of applications. These applications are summarized through a set of six key questions which asset value and related measures may help answer.

How the Guide Can Help

The guide can help an asset manager use asset value and related measures to answer TAM-related questions including:

1. What is the overall value of the asset inventory?
2. What is the cost to maintain current asset value?
3. How much should we spend on our existing assets?
4. How should funds be allocated between different assets or networks?
5. What's the best life cycle strategy for our assets?
6. What is the value generated by the asset?

Spotlight on Applications of Asset Value

The guide provides several examples in which measures related to asset value have been used to support TAM, including use of an asset funding ratio by the Vermont Agency of Transportation, a UK tool for calculating bridge conditions and value, and examples of calculating value-related measures for transit taken from research performed for the Transit Cooperative Research Program (TCRP).

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Chapter 9

Examples and Case Studies

This chapter provides a set of worked examples of the asset value calculation. Also, it provides selected international examples demonstrating application of similar concepts to those presented in the guidance.

What's Important

This worked examples show how all of the different approaches described in the guidance can be used. The examples include calculation of asset value for: a highway agency based on cost and market perspectives; a transit agency based on a cost perspective; and a highway agency based on an economic perspective. The examples are drawn from a set of four validation tests performed using the guidance. The international examples help connect the guidance presented here to international best practice in TAM.

How the Guide Can Help

Agencies can review the worked examples and case studies to better understand the nuances in the asset value calculations, and better evaluate which approaches may be relevant for their applications.

Spotlight on Highways England

One of the two international cases studies describes how Highways England calculates asset value. The company determines the fair value of its portion of the UK Strategic Road Network using Depreciated Replacement Cost (DRC). The calculation is made separately for pavements, structures, technology assets and land. Depreciation is based on the observed condition of assets. For pavement, condition is measured based on rutting. For structures, an Element Condition Score is obtained from structure inspections performed for each element of a structure. Highways England makes improvements to its valuation approach on a continuing basis. For example, in the future, Highways England plans to improve this depreciation calculation by including other pavement distresses, such as fretting and longitudinal cracking. Also, in the future the organization plans to perform a separate calculation for special structures on a case-by-case basis rather than using unit rates.