Chapter 2

Asset Valuation Framework

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, this guide encourages the use of a simplified set of steps and advises how to meet U.S. and international accounting standards.

Chapter 2. Asset Valuation Framework

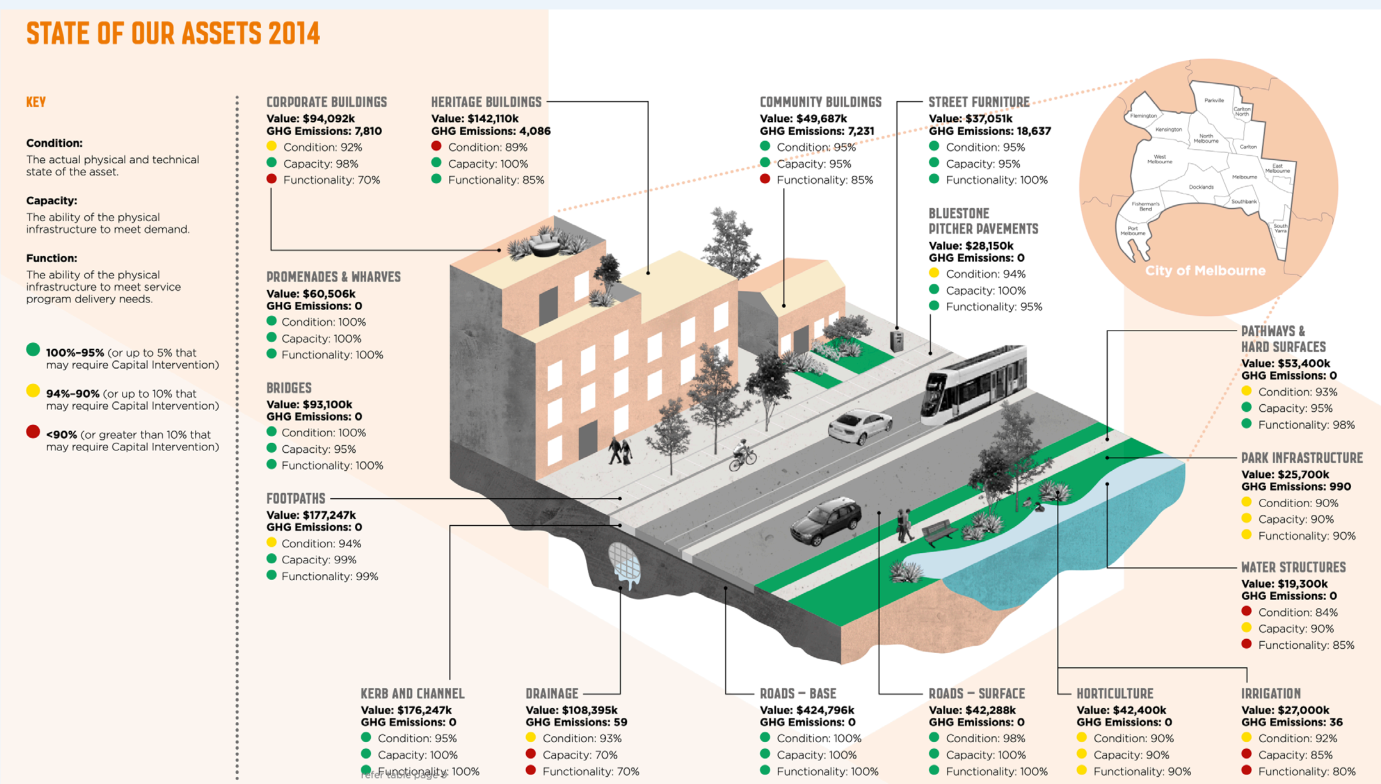
Section 2.1

Asset Valuation and Asset Management

Knowing what a physical asset is worth – its value – can be very useful both for financial reporting and for supporting asset management. Even if the notion of asset value is somewhat abstract, an asset owner generally prefers that the value of their assets increases or at least remain constant over time. Fundamentally, tracking and reporting asset value helps a transportation agency monitor the state of its assets and provides a sense of whether the inventory is improving or in a state of decline. Transportation agencies use data on asset value in a variety of ways to support asset management. Major applications of asset value aiding an overall asset management program are described below.

Communicating the Asset Inventory

Asset value is used to communicate what assets an agency owns, their extent, and the agency's responsibility for maintaining the asset inventory. Each asset



Source: City of Melbourne *(7)*

Figure 2-1. City of Melbourne Assets has its own unit of measure: pavements may be summarized in terms of lane miles, bridges in terms of deck area, and other assets in terms of a count. However, it can be hard to relate these different units and to summarize their asset portfolio as a whole. For instance, how does one lane mile compare to 1,000 square feet of bridge deck or 100 culverts?

Figure 2-1, reproduced from the Melbourne Asset Management Plan *(7)*, depicts the assets owned by the agency, including the roadway surface, roadway base, bridges, footpaths, drainage, buildings, and various other assets. Each type of asset is illustrated and labeled with its value and annual greenhouse gas (GHG) emissions. The City of Melbourne uses these two numbers to communicate the state of their assets to the public and other stakeholders.

Asset	Inventory (unit)	Replacement Value ($M)	Current Value($M)	Condition
Pavement	573.7 lane miles	$573.7	$393.8	
Bridges	63 bridges	$95.0	$80.7	
Culverts	844 culverts	$26.9	$13.7	
Signalized Intersections	52 intersections	$20.8	$10.0	
Medians	843,591 (sf) median 120,632 (lf) curb	$6.0	$6.0	
Guardrail	31,633 linear ft	$3.0	$1.7	
Pedestrian Ramps	924 ramps	$2.7	$1.1	
Signal/Sign Supports	4,970 sign supports 120 signal supports	$2.1	$1.1	
Pavement Markings	4,335,242 linear ft of markings 59,963 sq ft of transverse markings	$1.8	$0.9	
Signs	7,811 signs	$0.5	$0.3	
Stormwater	5,592 assets	-	-	
Lighting	116 assets	-	-	
Railroad Crossings	55 crossings	-	-	

Figure 2-2. Carver County Transportation Assets and Asset Value *(8)*

Figure 2-2 shows an example from the TAMP prepared by Carver County, Minnesota *(8)*. Here asset quantities and conditions are summarized for 13 transportation asset classes. Asset replacement value and current asset value are shown for the ten asset classes for which Carver County Public Works is responsible. The two asset values help communicate the state of the county's assets to the public as well as providing a financial account of the publicly-owned assets.

Demonstrating Fiscal Responsibility

Various measures have been formulated that use asset value and changes in value to demonstrate that an agency is managing its assets responsibly. The basic premise is that as assets deteriorate or depreciate in value, an agency should invest to maintain their value. Public agencies in Australia and New Zealand have used asset value in this manner for over a decade. The Australian Infrastructure Financial Management Manual (AIFMM) details recommended measures and practices for monitoring and applying asset value ***(9)***. A key measure in Australia is the Asset Sustainability Ratio (ASR), or ratio of spending on asset renewal and replacement to annual depreciation.

In the U.S., several agencies have calculated similar measures. **Figure 2-3**, reproduced from the Washington State Department of Transportation (WSDOT) Gray Book ***(10)*** includes several long-term measures for pavement assets related to asset value. The Gray Book is a quarterly performance report which covers a variety of aspects related to WSDOT's transportation system and assets. The Gray Book from the fourth quarter of 2019 includes the following long-term measures for pavement: ASR, Remaining Service Life (RSL), and Deferred Preservation Liability (backlog). In this case, ASR is calculated as the years of pavement life added through different treatments divided by life consumed.

	PAVEMENT ANNUAL PERFORMANCE MEASURES[1,2]		2017	2018	Agency Target	Target[3]	Trend	Desired trend
Short term	**Percent of pavement in fair or better condition** Measured for asphalt and concrete pavement (chip seal data was collected but has not yet been processed). Condition is shown by lane miles and by vehicle miles traveled to reflect road use.	Lane Miles	91.8%	91.4%	90.0%	✓	↓	↑
		VMT[4]	91.5%	91.2%				
Long term	**Asset Sustainability Ratio**[5] Years of pavement service life added to the pavement network through rehabilitation in a given year divided by the service life consumed in that same year.		0.90	0.61	0.90 to 1.10	–	↓	↑
	Remaining Service Life[5] Average percentage of original total useful life remaining before rehabilitation or replacement is needed; average years remaining before rehabilitation or replacement is needed.		47.4% (7.7 yrs)	46.9% (7.6yrs)	45% to 55%	✓	↓	↑
	Deferred Preservation Liability (backlog) An estimate of the accumulated cost (in current dollars) to fund the backlog of past-due (deferred) pavement rehabilitation work.		$346 million	$420 million	$0	–	↑	↓

Data source: WSDOT Pavement Office.

Notes: **1** Calculations for all measures, excluding percent of pavement in fair or better condition, include all pavement types (asphalt, chip seal and concrete). **2** See p. 16 for additional discussion of long-term measures. **3** Check indicates target met, dash indicates target not met. **4** VMT = vehicle miles traveled. **5** Measure is weighted by vehicle miles traveled to better capture the typical road user's experience.

Figure 2-3. WSDOT Pavement Performance Measures *(10)*

Testing Investment Strategies

Asset value can be used to help illustrate the difference between alternative investment strategies, such as when comparing a strategy of performing recommend preservation treatments on an asset over its life to an alternative strategy in which preservation treatments are deferred, resulting in worse relative condition and potentially a shorter asset life.

One way to compare different investment strategies for a given asset is to perform a life cycle cost analysis (LCA). In such an analysis, the costs for an asset are computed over time for a given scenario relative to a base case. A results of a given investment strategy can be summarized by calculated the net present value for the strategy, where NPV is the sum of the discounted benefits of the asset less the sum of discounted costs.

Asset value is potentially relevant to such an analysis in two ways. If one adopts an economic interpretation of asset value, as discussed further in the next section, NPV can serve as the definition of asset value. However, even when asset value is computed differently from NPV, it can be used to represent the residual value of the asset at the end of the analysis periods. This provides a way to compare investment scenarios that result in different condition and/or remaining asset life.

Prioritizing Investments

Another potential application of asset value for supporting TAM is helping compare and understand asset investment options. While asset value alone is insufficient for prioritizing investments, when used in conjunction with life cycle cost analyses it can provide a complete view of the asset's worth. In particular, asset value can help prioritize decisions such as:

- Resilience investments;
- Reconstruction; or
- Decommissioning

Asset value provides insights for assets identified for decommission or reconstruction by pitting their intrinsic value (including the replacement cost and socio-economic importance) against the costs necessary to maintain or replace the asset. Asset value also supports investment decisions for resilience investments by placing an emphasis on the importance of asset renewal to mitigate future risks and by directly accounting for the potential costs associated with a risk.

In these applications, asset value is defined broadly, considering the cost of constructing the asset and its value to road users and society. For example, in determining which bridges to focus on for a set of resilience investments, one might consider the cost of replacing or improving each bridge, the risk to the bridge as a result of flooding or other events, the level of service the bridge provides, and the impacts to mobility in the event the bridge is closed. The inclusion of asset value in the investment decision could lead to the renewal of the asset to withstand the risks, or it could suggest an asset should be allowed to fall into obsolescence. Either way, it provides context to the investment decision.

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Section 2.2

Defining Asset Value

Thus far, we have discussed how asset value can be used to support TAM but not what it actually represents. This begs the question, what is asset value? According to the definition established by Organisation for Economic Co-Operation and Development (OECD), in its report ***Measuring Capital (11)***, a physical asset has no intrinsic value. Instead, its value results from the benefits it yields, be they to the asset owner, a set of transportation system users, society as a whole, or some combination thereof. As an asset ages, it depreciates, or loses value, when its benefits are consumed.

Speaking generically about capital and its value, OECD discusses that capital has a dual nature; it serves both as a means to store wealth and as a source of capital services. OECD further discusses the different perspectives on asset value as well as the fact that the best perspective depends on one's "analytical purpose."

Figure 2-4 illustrates the different perspectives on transportation asset value, adapting concepts from the OECD discussion. The figure illustrates three perspectives: a market perspective, a cost perspective, and an economic perspective. Each perspective is discussed further below.

Asset Value

Definition

Asset Value: the discounted stream of future benefits that the asset is expected to yield.

Depreciation: loss in the value of an asset as it ages, equivalent to the consumption of fixed capital.

Source: OECD, *Measuring Capital*

Cost Perspective

The cost perspective focuses on capital costs incurred by the asset owner. When establishing value from this perspective one asks: "How much does it cost us to acquire this asset and operate it over time?"

In cases where a competitive market exists for an asset, the cost and market perspectives yield the same result for the initial value of an asset; the cost is notionally the price of the asset on the market. However, this perspective still yields a value in cases where no market exists, or where the market is not competitive. Even if there is no market for an asset, there is still a cost incurred in purchasing, constructing, and operating the asset over time.

One important consideration in adopting the cost perspective is to establish whether to use historic or current costs. The historic cost of an asset is the cost that was actually paid for the asset. The current cost is the cost of replacing the asset in today's dollars, regardless of what was actually paid in the past. GASB Statement 34 specifically requires agencies to report the historic costs of asset purchase or construction, as is consistent with U.S. Generally Accepted Accounting Principles (GAAP). U.S. GAAP emphasize the use of conservatism, or avoiding the overstatement of net assets and income. Thus, U.S. agencies must report asset values using historic costs or estimated historic costs in their financial reports to be consistent with either method in GASB 34, even if they calculate value in other ways to support TAM.

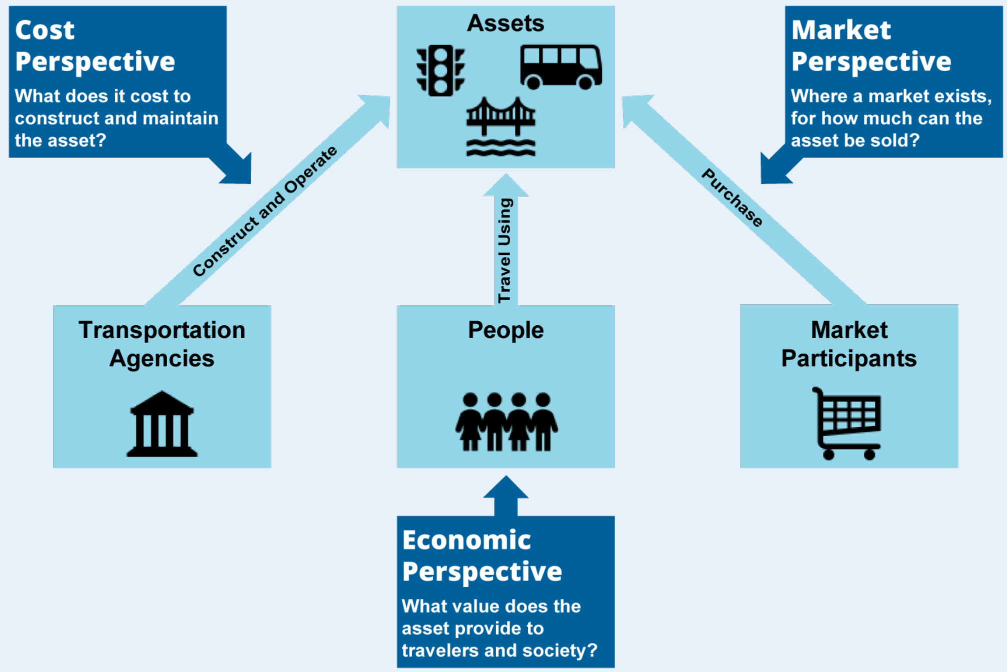

Figure 2-4. Perspectives on Asset Value

For supporting TAM, and for financial reporting outside the U.S., asset owners tend to use the asset's current replacement cost in today's dollars rather than the asset's purchase price. The use of the current replacement cost is recommended for calculating the fair value of an asset as defined in IFRS Number 13. This cost is used as a proxy for the price that would be charged for the asset in the event that a market existed. Also, it is the cost that is most relevant to an asset manager trying to make investment decisions that involve spending money in today's dollars.

The basic issue with the cost perspective is that it leaves no daylight between cost and value; these are one and the same. If one asks what value will be derived from spending $1 million to reconstruct a road, from the cost perspective the answer is "$1 million, of course." Consequently, the cost perspective can help answer questions about how best to manage assets, but it is ill-suited for addressing questions concerning the underlying value of transportation assets to society. For answering such questions, one must instead turn to the economic perspective.

Market Perspective

The market perspective focuses on the price of an asset on the open market. When establishing value from this perspective one asks: "For how much can an asset be sold on the market?" For example, when valuing an automobile one might seek to determine the resale value should the car be sold through an auction or to a reseller.

The virtue of this perspective is that it leverages the behavior of free markets to determine how much value an asset is expected to yield in the future. If the market for an asset is competitive, then the asset's market value should theoretically account for the future benefits provided to the buyer. After all, nobody would want to purchase an asset at a cost greater than its expected benefit. The competitive nature of the market should ensure that no asset is sold at less than this value. Thus, this perspective is extremely valuable where a well-defined market exists for an asset.

The challenge with adopting this perspective is that it can be hard to identify a market, let alone a competitive one, for many types of transportation assets. Markets typically exist for assets that are manufactured and can be readily exchanged between different parties, including many types of vehicles, equipment, facilities, and land. Fixed assets, such as the roads and bridges necessary to provide mobility to society, are not particularly mobile themselves, and they do not lend themselves to being resold once constructed because they do not generate revenue. Markets can exist for toll roads and bridges, but it is important to note that the prices in these markets may not be wholly indicative of the asset's condition, as they typically involve the leasing, not the sale, of an asset for an allotted period of time. Also, the market price does not account for externalities – costs and benefits placed upon others and not perceived by the buyer. An example of a positive externality is the support of emergency services such as ambulances; negative externalities include items such as air pollution, congestion, and noise. Depending on the application, it may be necessary to adjust the market price for externalities.

Fair Value

Definition

Fair Value: the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.

Source: IFRS, *Standard Number 13: Fair Value Measurement (3)*

One approach for calculating a market value for fixed assets is to examine cases in which infrastructure has been privatized, such as where a private firm bids to own, operate, and maintain a highway. The asset value considerations and applications for private infrastructure are explored further in Chapter 4. For now, to use this as the basis for establishing value for other assets one must ask:

- To what extent can the price of a given privatization contract or other transaction be generalized to other transportation assets? For instance, it may not be reasonable to apply the value of a specific toll road to other non-toll roads and bridges. These assets' risks, costs, and revenues depend on unique characteristics, such as the length of the contract or local traffic flow, which are not easily generalized or tracked.
- Does the market price account for the full range of benefits and externalities? In the example of a toll road, one can use the transaction price to determine the value of future tolls for a specific road. However, this does not account for impacts of traffic diverted to or from other roads as a result of the toll

road, changes in consumer surplus to road users being tolled, environmental impacts, and a host of other issues.

- Is the market competitive? Certainly, a public agency awarding work always seeks a competitive market, but in large, high-cost bids there may be a small number of bidders, and it may be difficult to establish whether a competitive market actually exists. **If the market exists but it not competitive, then it is possible to establish a market price, but it may be a different price than that of a truly competitive market.**

However it is established, the market value of an asset is viewed as the best representation of asset value based on international accounting guidance. Based on the IFRS 13 standard, the fair value is the price that would be set for an asset in a market, in the event one existed, regardless of whether such a market actually exists. Where no such market exists, IFRS 13 describes using the cost of the asset as a proxy, consistent with the cost perspective.

Economic Perspective

The economic perspective focuses on the benefits generated by an asset. When establishing value from this perspective one asks: "What are the benefits of the asset to travelers and society?" In general guidance for asset value ***(11, 12)***, this perspective is also called the "income perspective", as it involves calculating the income generated by an asset.

The valuation of an asset is a fundamental area of economic analysis, especially in the context of a benefit-cost analysis (BCA) conducted to determine whether improvements to an asset are worthwhile. When conducting a BCA, one determines the cost of an investment as described above for the cost perspective and calculates economic benefits by observing the choices people make to infer the value they derive. Transportation facilities do not intrinsically generate value. Instead, value is generated when a facility is used to transport people or goods. Analysis of the different values incorporates forecasts of roadway uses, which are typically obtained from travel demand models that frame transportation choices through a nested set of decisions, including whether or not to take a trip, and if the trip is taken, which destination, mode, and route is chosen. Since operating a wide network of roadways expands transportation choices, and thus the implicit value of exercising an option to travel, a fundamental purpose of asset management is to maintain existing facilities so that their use generates value.

The cost, market, and economic perspectives on asset value differ in subtle and important ways. For example, a cost perspective generally starts from an implicit assumption that a facility is worth maintaining at the level of service for which it was originally planned and constructed. The actual use of the facility does not factor into the assessment except when it is used to indirectly estimate the rate of deterioration and maintenance schedule. In comparison, the market approach directly considers the value of the facility to users in addition to the cost to maintain it. The market approach can be considered from the perspective of a concessionaire who could evaluate the facility based on their opportunity to recover their cost and earn a profit, through revenue collection. Accordingly, the number of users and their willingness to pay for using the facility are key determinants of value. Note also that this willingness to pay is typically associated only with users' potential for saving time or out-of-pocket costs.

In contrast, an economic measure of asset value stems from a more comprehensive value, based on the use of a facility. Economic asset valuation is an analytical exercise that establishes a rationale on whether and when a facility ought to be constructed or improved. Academic literature and practitioner-oriented documents and guidelines discuss two ways in which a transportation facility provides economic value ***(13, 14)***. A user-based measure of value draws directly from separable and additive accounting of key benefit categories, such as travel time, out-of-pocket expenditures, accident risk, pollutant externalities, and pavement maintenance, and some potential site-specific impacts that arise from facility use or location. Alternatively, where transportation facilities lower the cost of mobility, they can induce more productive investments in capital and labor, key measures of gross domestic product (GDP), and a macroeconomic indicator of transportation value. There are various challenges in linking economic benefits to specific changes in GDP. The approach presented here addresses the economic benefits of transportation assets without making an explicit linkage between these benefits and GDP.

There are several important dimensions in a user-based, economic valuation of transportation assets that one must consider when valuing assets from an economic perspective. These include the following:

- **Relative value.** Since a transportation facility has no intrinsic value (beyond its use), economic valuation of an existing facility constructs a counterfactual case (e.g., an alternative design, route or mode) for comparison with current conditions. Depending on the asset management context, several different types of alternatives could be established for comparison.
- **Measures of value.** Transportation investment has a number of different impacts both positive and negative. A variety of different measures are needed to quantify the value from an investment. These include, but are not limited to, travel time savings, vehicle operating costs, crash costs, emissions costs, costs from environmental impacts, changes in property value, and agency costs.
- **Consideration of the stream of costs and benefits.** The time span over which asset value is measured creates complexities since many roadways are already or will become long-lasting corridors that communities develop around. The present value of a facility's future uses must be determined, and this is directly determined by a discount rate intended to reflect the present value decision-makers place on any future uses.

- **Changing contexts.** It is not enough to manage assets assuming current valuation conditions will remain in perpetuity. For example, the value of a transportation asset may change if policy perspectives shift toward free-access facilities versus revenue-generating ones or if climate conditions render facilities more vulnerable to extreme events.

Reconciling Perspectives on Asset Value

Each asset value perspective emphasizes a specific aspect of how transportation assets are constructed and utilized. All three perspectives are valid, and can provide insights that help communicate information about assets and support decision-making.

While each of the perspectives supports some of the applications described in Section 2.1, many public agencies rely on the cost perspective for their calculation of asset value. The cost perspective helps an agency directly relate its expenditures on assets to changes in their value, and it supports a large number of TAM-related applications. Also, where a market exists, the cost of replacing the asset, depreciated based on its age or use, tends to correlate closely to its price. Where no market exists, the depreciated replacement cost serves as a proxy for its market price.

Regarding the relationship between the cost and economic perspectives, the cost of an asset does not provide direct insight into the economic benefits generated by an asset, and cannot support decisions that rely on this information. However, if one assumes that an existing asset is worthy of maintenance, the expectation is that its benefits over time must at least equal, and may greatly exceed, its replacement cost. Further, whatever the benefits may be to transportation users and society, those benefits will continue to accrue provided the asset remains in service. Thus, for many TAM applications it is sufficient to focus on the cost to the agency of keeping the asset in service through efficient maintenance and planning, with the assumption that doing so is inherently worthwhile.

Chapter 2. Asset Valuation Framework

Section 2.3

Steps in Calculating Asset Value

This section outlines the basic steps in calculating asset value. Though they are intended to support the different applications described in Section 2.1, the steps are the same regardless of the specific application, and regardless of which perspective described in Section 2.2 one assumes. The steps explicitly acknowledge the different applications and perspectives, and they walk the analyst through the key decisions for calculating asset value. **Figure 2-5** summarizes the steps to calculate asset value, and the following subsections describe each step further.

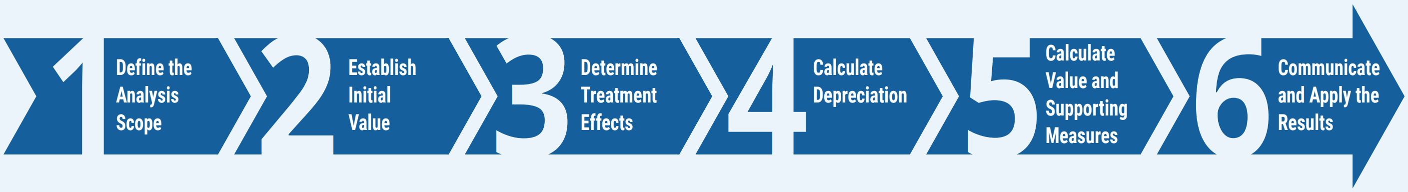

Figure 2-5. Calculation Steps

Description of the Steps

Define the Analysis Scope

The first step is to determine the scope of the analysis. Here, one must determine the assets for which they will calculate value, and the level of detail at which the calculations will be performed. The selected approach depends upon the intended application of the asset value calculation.

When deciding which assets to incorporate, one must consider both the specific asset classes and the systems or networks included in the analysis. For example, to comply with Federal requirements for TAMPs, State DOTs must calculate asset value for two asset classes – pavements and bridges – under one system – the NHS.

All asset classes identified in the requirements should be included in the calculations, and no asset should be included in multiple classes. However, when calculating the value for pavement, one must decide if this includes the value of shoulders, guardrails, signs and traffic signals, and Intelligent Transportation Systems (ITS). Ideally, the decision of what asset types to include is supported by a review of a comprehensive asset register and a consideration of the available data.

The level of detail required for the analysis is a function of the intended applications of the asset value calculation and the availability of data. In concept, the level of detail should be sufficient for specifying the impact of different treatments considered in the calculation, though this topic is discussed further in Step 3 – Determine Treatment Effects. Ideally, one should include treatments that add life to an asset and analyze assets at a level of detail that accounts for treatment effects. For instance, it may be necessary to consider major components of a bridge (deck, superstructure, substructure) separately in the analysis, given these components have different lifespans and some treatments may extend the life one component but not another (e.g., deck replacement or substructure repair).

Establish Initial Value

Once the analysis scope has been established, the next step is to decide how to calculate the initial value of an asset. This step accounts for the different applications and perspectives of asset value.

For many TAM applications, the preferred approach is to establish the initial value based on the asset current replacement cost in today's dollars. As discussed in Section 2.2, this approach supports decisions regarding how an agency should spend its available budget on its assets. This approach tends to be the most straightforward to implement, and it is recommended as a default.

However, for certain applications it may be preferable to use an alternative approach to establish asset value. For U.S. agencies that seek to maintain consistency with their approach to financial reporting, it may be necessary to establish initial value based on purchase price, consistent with GASB 34. For applications that involve considering which assets should be constructed or maintained, an economic perspective may yield a more defensible result. Where market value is available, this is usually preferable, particularly given the ease of calculation relative to other approaches.

Determine Treatment Effects

Another important step in calculating asset value is determining treatment effects. Here, one must establish what treatments will be explicitly considered in the analysis, treatment costs, the assets that a treatment impacts, and the effects of treatment. Depending on the depreciation approach, one may specify treatment effects in terms of change in asset life or change in asset condition (which can then be converted to a change in effective life).

The major question to answer in this step is what treatments to consider. At a minimum one should consider asset replacement or reconstruction, and the treatments identified in an asset's life cycle analysis should be reviewed as well. Frequently, it is necessary to consider other treatments short of replacement or reconstruction to support TAM applications. For example, when trying to demonstrate the value of performing preventive maintenance activities for pavement, one approach is to show how asset value for a representative pavement section changes over time with and without preventive maintenance.

Once the treatments are established, one must specify treatment costs, what assets or asset components are addressed by a given treatment, and the effects of treatment on asset or component life or condition. Treatments that are assumed to occur but not explicitly considered should be reflected in estimates of asset life; preventive maintenance activities often fall within this category. For instance, an estimate of the life of a new pavement should assume preventive maintenance treatments occur as scheduled.

Establish Depreciation Approach

Depreciation is necessary when calculating how asset value changes with time. Any asset with a finite life loses value over time. As in the case of calculating initial asset value, there are many different approaches to calculating depreciation. The best approach to use depends on the intended application of the calculation, one's perspective on what value represents, and the data available to support the calculation.

While depreciation tends to increase as an asset ages, the specific relationship between age and depreciation is complex. The most straightforward assumption – and often the best assumption, unless one has the data necessary to define a nonlinear depreciation – is to assume a linear relationship. In a linear relationship, asset value declines at a uniform rate across its lifetime until it reaches a residual or salvage value at the end of its useful life.

Where an asset owner has information on the condition of their assets, they can use this information to establish an effective asset age. An asset may last longer than initially expected because it is deteriorating at a lower rate or because it receives treatments to maintain it. In these cases, the asset may have an effective age much lower than its actual age. Conversely, the effective age of an asset may be greater than its actual age, if it is in poor condition, such as that resulting from accelerated deterioration.

One may need to calculate depreciation in a different manner for certain applications. In particular, a more fine-grained calculation of the pattern of consumption of economic benefits may be needed in some cases, particularly if one is calculating initial value considering the stream of future benefits yielded by an asset based on an economic perspective. Chapter 6 presents additional details on the approaches to calculating depreciation, including guidance and examples.

Calculate Value and Supporting Measures

At this point in the process, all of the decisions about how to determine asset value have been made, and only the calculation remains. Every asset valuation requires calculating the initial value for all assets and components, and typically includes some approach to depreciating that value to obtain a current value. Depending on the specific application, this step may also include calculating:

- The cost to maintain asset value;
- Asset Sustainability Ratio (ASR);

- Asset Consumption Ratio (ACR);
- Asset Funding Ratio (AFR);
- NPV for an asset or group of assets; and/or
- Other measures.

Communicate and Apply the Results

Once asset value has been calculated, the final step is to communicate and apply the results. Various approaches have utilized asset value as a communication tool, with several such examples illustrated in Section 2.1. Also in this step, one may need to interpret the results of an analysis to evaluate the significance of any changes in asset value and the values of supporting performance measures.

It is important to document the approach used for calculating asset value, and the key assumptions made in the calculation process. Depending on the specific application, one may wish to perform a sensitivity analysis to establish the impact of changes in key parameter values on the results of an analysis. A sensitivity analysis is useful for describing the accuracy of the asset valuation calculation and highlighting any variables which have a significant impact on the asset value. While sensitivity analyses are always applicable, they are most beneficial in cases where there are numerous assumptions leading up to the final calculation. Many calculation parameters that are presumed to be invariant and known with uncertainty are, in truth, uncertain and prone to vary in the future.

Chapter 2. Asset Valuation Framework

Section 2.4

Relationship to Accounting Standards

There are different accounting standards in the U.S. and internationally for valuing assets for the purpose of financial reporting. These standards describe best practices in accounting that agencies should carefully consider when valuing assets to support TAM. However, particularly in the U.S., the approach an agency uses to value assets for TAM often differs from that used for financial reporting. The following subsections provide further detail on U.S. standards and international standards, and the applications of these standards to support TAM.

U.S. Standards

GASB Statement Number 34: Basic Financial Statements - and Management's Discussion and Analysis - for State and Local Governments published in 1999 ***(1)*** describes how U.S. public agencies should prepare their basic financial statements, including the reporting of capital assets. GASB 34 requires agencies to report capital assets by their historic cost, also known as purchase price. This approach is recommended to maintain consistency with the U.S. GAAP.

GASB 34 allows for two different approaches for handling depreciation of capital assets. By default, an asset is depreciated over its estimated useful life. The standard does not specify how depreciation is calculated, only that it should be calculated "...in a systemic and rational manner." In practice, agencies typically assume an expected useful life by asset class and apply straight-line depreciation.

GASB 34's alternative approach to account for depreciation is the "modified approach." In this approach, an asset's historic cost is reported but no adjustment is made for depreciation. Instead, a separate calculation determines the cost to maintain and preserve the asset at a specific level of service, and this cost is disclosed. The asset is treated as an "ongoing concern", and the cost of maintaining the asset is considered a part of the cost of operating the transportation system, rather than as an adjustment to the asset value.

The modified approach may be used for infrastructure assets that are part of a network or subsystem of a network. To use the approach an agency must:

- Have an up-to-date asset inventory;
- Perform periodic condition assessments at least every three years and summarize the results;
- Maintain assets "approximately at (or above)" the established condition level

based on the three most recent condition assessments; and

- Estimate each year the annual amount to maintain and preserve assets at a specified condition level.

International Standards

Internationally, the IFRS are the predominant accounting standards. The IFRS Foundation reports that globally 166 jurisdictions and 15 of the 20 G20 countries use its standards (the exceptions are the U.S., Japan, China, India, and Indonesia). As noted in Chapter 1, IFRS standards are not specific to the public sector, and IPSAS standards have been developed for public agency use. However, as a practical matter IPSAS standards typically refer to relevant IFRS standards, so the text here focuses on the relevant IFRS standards.

The IFRS standard ***IAS 16: Property, Plant and Equipment (2)*** describes how to calculate costs and depreciation for fixed assets. This standard was developed prior to IFRS Number 13, which is described further below, but it has since been updated to reference it. IAS 16 describes that an organization should recognize an asset at its cost when it is originally acquired. Following the original recognition of the asset, an organization can use one of two models for measuring its value: the cost model or the revaluation model.

The cost model is similar to that described in GASB 34. With this model, the value of an asset is its cost adjusted for depreciation. To calculate depreciation, one must first establish the useful life of the asset considering the expected usage of the asset, expected wear and tear, technical or commercial obsolescence, and legal or other limits on the use of the asset. One must also establish the residual value of the asset once it reaches the end of its useful life and the depreciation method for adjusting its value over time. The standard explains that different depreciation methods may be used and that the selected method should be that which "…most closely reflects the expected pattern of consumption of the future economic benefits embodied in the asset."

The revaluation model may be used as an alternative to the cost model. In this model, the asset is periodically revalued to determine its fair value. Between revaluations, the cost model is used to adjust the valuation. The standards note that revaluation should be made with sufficient regularity to ensure there is no material difference between the calculated cost and the asset's fair value.

IFRS Number 13: Fair Value Measurement ***(3)*** defines fair value. It recommends using the price of an asset for financial reporting, where this can be determined, and it provides guidance on estimating the price where it cannot. The standard also describes a hierarchy used to categorize fair value estimates based on what type of data are used. Ideally, the fair value is established using Level 1 inputs, the asset's (or an identical asset's) quoted price in an active market. When Level 1 inputs are unavailable, Level 2 inputs should be used. These include market prices of similar assets or prices from inactive markets and observable data, such as interest rates. Level 3 inputs, "unobservable inputs for the asset or liability", are relied on when there is no discernable market, and they are accorded to the lowest priority.

IFRS Number 16: Leases ***(15)*** includes additional information relevant to fair value calculations for certain situations. In this standard, fair value is defined in the context of a lessor's account requirements as "the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction."

It is important to note that while international standards allow for use of either historic costs or fair value for valuing assets, the general trend of public agencies in Europe and Australia has been to value assets based on their depreciated replacement cost (DRC), consistent with the fair value approach. This trend is exemplified by recent U.K. and Australian asset valuation guidance for public agencies ***(12, 16)***.

Application to Asset Valuation for TAM

The standards described above are applicable to asset valuation for financial reporting. U.S. agencies must follow GASB 34 for financial reporting, but they are under no obligation to use the GASB 34 asset values for other purposes. Furthermore, they are under no obligation to comply with international accounting standards for any purpose. Nonetheless, the U.S. and international standards are important for defining key concepts and establishing best practices. The different accounting standards have been adapted for use in the context of calculating asset value to support TAM with the following considerations:

- While it is not required, some agencies may prefer to maintain consistency between estimates of asset value prepared for financial report based on GASB 34 and for supporting TAM. The guidance describes an approach for maintaining this consistency where desired.
- Agencies using the GASB 34 modified approach have already made a strong linkage between financial reporting and TAM. This approach requires that an agency uses its asset management systems to calculate the cost to maintain its assets. Given that assets are treated as an "ongoing concern" in this approach, they are not depreciated. Ideally, agencies using this approach should utilize the same cost to maintain assets for TAM and for financial reporting. This helps ensure consistency between the financial asset register and technical asset register (e.g., asset values as captured in an Enterprise Asset Management software system).
- While it is not binding for U.S. agencies, IFRS 13 describes best practices for calculating fair value of an asset. The IFRS concepts, terms and guidance are applicable to U.S. agencies calculating asset value using a cost or market perspective.

Other IFRS and IPSAS standards, as well as the standards and guidance of international agencies based on these, help define concepts, terms, and best practices for aspects of the asset valuation calculation process, such as in establishing useful life, calculating residual value, selecting a depreciation method, and deciding how to componentize assets. These concepts are highly applicable to U.S. agencies calculating asset value for TAM.