

Incorporating Asset Valuation into Transportation Asset Management Financial Plans



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1. Introduction and Overview

Transportation agencies face the challenging task to maintain, preserve and improve infrastructure assets for current and future generations while grappling with limited funding. Because assets such as pavements and bridges have long useful lives, sound asset management requires a long-term approach. Experiences from U.S. and international agencies with mature asset management processes show that sustaining the condition of assets is helped by long-term financial plans that are linked to long-term asset management strategies. Comprehensive transportation asset management plans (TAMP) can demonstrate expected and desired projections of asset performance and condition for ten or more years into the future. A TAMP can address the amount of investment required each year for the rehabilitation, preservation, and maintenance of assets during the plan period. The associated financial plan can be linked to the targeted

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performance and conditions of the assets to document any projected funding gaps. The financial plan can illustrate the financial state of the agency and express the financial needs for the plan period. The strategies in the financial plan can succinctly highlight the actions that need to be taken over the long term to maintain the health, performance, and condition of the assets.

The financial plan also can address financial risks. It could enable the agency to monitor and compare the funding available to the funding projected throughout the life of the plan, document tradeoffs, and note corrective actions to

accomplish the agency's asset management objectives. By acknowledging these risks, the financial plan brings credibility to an asset management plan.

Well-developed financial plans allow agencies to accomplish several important goals. These include:

- communicating with the public and stakeholders the value of transportation assets;
- present the current, projected, and desired condition of assets;
- document the funding required to support those conditions;
- explain the financial risks, and accompanying revenue forecasts.

The Potential Role for Asset Valuation and Depreciation

This fifth and last report in the financial plan series addresses asset valuation and depreciation.

Asset valuation translates infrastructure conditions into monetary terms as public wealth or equity. Its corollary is depreciation. Depreciation captures the cost to public wealth or equity as assets age or deteriorate through use or neglect. Valuation and depreciation help portray infrastructure as part of the public's "portfolio of wealth" that merits sound management, investment, and preservation.

Asset valuation plays a much larger role in asset management in England and Australia than it does in the United States. This report compares and contrasts U.S. practice to

that in other countries and it explores the potential for asset valuation to play a larger role in U.S. asset-management efforts. It also explores challenges to expanded use of asset valuation and depreciation.

2. Asset Valuation Defined

This report defines asset valuation as the assignment of monetary value to infrastructure based upon its size, age, condition, replacement cost, or original cost to construct. Asset valuation is ambiguous because it means different things to different disciplines. To an economist, the value of infrastructure consists of its contribution to economic activity. In the economist's view, the value of roads, bridges, or buses can be determined by their generation of travel time savings, accident reductions, or economic activity. To a businessperson, income-generating potential or the market price of comparable assets determines their value. Business-valuation experts estimate an asset's value by how much revenue it can generate, or what a willing seller would pay for it in an "arm's length" transaction.^[1]

This report focuses upon the transportation asset manager's perspective on asset valuation. In this report, the value of assets is based upon their physical nature, size, age, condition, components, or some derivative of their cost to construct. In the international transportation asset management frameworks discussed in this report, asset valuation generally relates to these physical characteristics inherent within the assets. They do value some assets such as income-generating toll road service plazas based upon their potential sale price. However, international agencies generally value most assets based upon their cost, age, and condition. By focusing asset valuation upon the age or condition of the asset it supports the sound long-term maintenance of it.

The Benefits of Asset Valuation

Asset valuation plays a large role in several international asset management frameworks because it emphasizes that transportation assets represent government's largest capital investment. Roads and bridges are public capital and comprise one of the largest sources of public wealth. The recording of infrastructure as capital reflects a business-sector accounting perspective that emphasizes that an entity's "wealth" is not limited to cash, stocks, or bonds. Its land, building, factories—and in the case of transportation agencies—its infrastructure comprise a large component of its wealth. Just as government must be a responsible steward of cash or bonds, it also should be a responsible steward of all capital assets, the largest of which is the transportation network. As one British guidance document states, "Putting a monetary value on the assets is important because it emphasizes the substantial value that is tied up in them and hence the need to invest in maintaining their value."^[2]

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The relatively large size of this investment is captured in states' comprehensive annual financial reports, or their CAFRs. The 2014 Washington State CAFR reports \$35.4 billion in capital assets, or physical assets as opposed to cash or pension-fund investments. Of that \$35.4 billion,

\$21.7 billion are transportation infrastructure.^[3] The 2014 State of Utah CAFR reports \$17.1 billion in capital assets with \$13.4 billion consisting of infrastructure.^[4] The 2014 Florida State CAFR reports \$62.8 billion in capital assets with \$37.6 billion of that being infrastructure. In Ohio, the 2014 CAFR reports \$25.8 billion in capital assets with \$19.9 billion comprising state-owned roads and bridges.^[5] As will be

discussed below, these values are understated substantially at least in comparison to valuation practices of other countries. Although these values represent the relative magnitude of infrastructure value compared to a state's total capital assets, the nominal values stated are much less than actual values because of U.S. accounting standards that will be discussed below.

Australian and British transportation agencies emphasize valuation as a significant component of transportation asset management. In those countries, transportation engineers and planners collaborated with accountants to move toward a common reporting approach. The intent is to have the disciplines "speak a common language" so that the finance and engineering staff are preserving physical capital with diligence comparable to the managing of financial capital.

In Great Britain, the Chartered Institute of Public Finance and Accounting (CIPFA) collaborated with the UK Roads Liaison Group (UKRLG) that is an association of national and local governments. The accounting body developed a Code of Practice on Transport Infrastructure Assets that provides guidelines on assigning monetary value to physical assets. The accountants coordinated with the Roads Liaison Group that produced asset management guidelines. The two coordinated the financial management and valuation guidelines with a pavement management system and draft bridge management system. The intent is to generate common values for asset management and financial management decision making.^[6]

CIPFA says the financial reporting code and its emphasis on asset valuation supports long-term financial planning and budgeting, good evidence-based asset management, and transparent information on agencies' management of high-way assets. Its guidelines say that the local highway networks and other transportation infrastructure represent by

far the largest capital asset that the UK public sector holds. However, few local governments know what their infrastructure is worth, and detailed inventory and condition information are not uniformly available. Although there is a perception that transportation assets are underfunded, the amount of investment to sustain them is unclear.

The British guidelines advance the concept that physical assets have financial value by stating that good financial planning and good engineering overlap with transportation asset management. An example lies with asset inventories. In U.S. practice, asset inventories are thought of as a planning, engineering, or maintenance support tool. The British guidelines cite asset inventories also as financial tools that allow for the identification and valuation of the agency's physical capital. Similarly, pavement and bridge management systems serve the needs of engineers, planners, programmers and

CORPORATE REPORTING

In the corporate world, asset valuation is a basic component of financial reporting to investors and shareholders. The Union Pacific railroad's 2014 annual report says that total capital investment to maintain and improve its railways and rolling stock increased from \$3.176 billion in 2011 to \$3.496 billion in 2013. This investment more than offset reported depreciation of \$1.77 billion. This increase in capital investment contributed to a total growth in assets from \$45.1 billion in 2011 to \$49.7 billion in 2013. The effect of this growth is each shareholder owned part of a company with a "book value" of \$49.7 billion in 2013, up nearly 10 percent in two years. If UP's depreciation outpaced its capital investment in infrastructure, shareholder value would have declined instead of grown.

accountants who make project and program decisions. For accountants, the deterioration curves and forecasting scenarios support estimates of long-term investment needs that the accountants and financial staff should anticipate. Good unit cost data not only helps the planner and estimator but they allow the finance staff to improve forecasting of investment needs. The overlap of engineering and finance resulted in the code's development to serve the needs of both. The code attempts to identify standards that will generate data to allow both the transportation asset managers and the agency financial staff to do their jobs.

“Effective implementation will require highway engineers and finance staff to work closely together to ensure that financial information is timely, consistent and of high quality to meet the needs of both.”^[7]

In the British guidelines, further overlap between asset management and financial management is encouraged by using asset-inspection protocols to help estimate asset values. One of the first steps in valuing assets is to identify their components. For example, the underlying rights-of-way and earthworks seldom depreciate. However, pavement layers and drainage components do. For valuation purposes, the inventory is broken down into components and each component valued and depreciated separately. This “componentization” is recommended to be coordinated with the inspection protocols. If bridge components are inspected as individual items of the structure, those same component classifications are used to determine the value of different bridge elements. In this way, the value of a bridge deck could be differentiated from the value of the superstructure, just as the condition of the deck can be differentiated from the condition of the superstructure. Similarly, if pavement surfaces are inspected, those inspection reports feed the estimate of pavement age and condition that determine the pavement layer's value.

NUMBERS: ESTIMATES VERSUS ABSOLUTES

To fully understand financial statements, one must appreciate that their numbers often represent approximations. Although a checking account may be balanced to the penny, such precision is not possible when making revenue forecasts, or when assigning costs for depreciation. A checking account is a short-term “cash” account. It can be absolutely balanced. However, forecasts of future revenues and the allocation of long-term depreciation are “accrual” estimates. They are my nature approximations.

Basic concepts in accounting are “accrual,” “allocation,” and “recognition.” These mean that revenue, expenses, and profits are often estimated and spread across many months, years, or even decades. If a widget-making company purchases a \$1 million widget-making machine it will spread the purchase price across years or decades on the financial statements. This reflects the basic accounting concepts of “accrual” and “allocation.” The cost of purchasing the widget-making equipment is allocated or spread across the company’s widget-making functions. The company’s cost of widget production reflects the accrued or allocated cost of the \$1 million equipment. If the equipment helps produce a product for 10 years, its purchase price is spread, or accrued, across the cost of production for 10 years. These practices lead to numbers on financial reports that do not correlate to any actual income or outlay. The \$1 million price of the equipment may never appear on the financial reports as a \$1 million outlay. Instead one-tenth of its cost may appear in 10-year increments if it is depreciated over 10 years. Also complicating the issue is there are many different ways

to depreciate the equipment, each of which generates a different annual depreciation cost.

Accounting logic says when the company bought the \$1 million machine it exchanged \$1 million in cash for \$1 million in equipment. Its assets remain balanced. The costs are recognized as the machine is depreciated, or a bit of its economic value is consumed each year. Analogous in the public sector, if a transportation agency buys from a contractor a \$1 million bridge, the agency still has \$1 million in value. The value is in infrastructure, not cash. The loss in the agency's value occurs over time as the bridge depreciates, which reflects its "consumption." Estimating the annual depreciation is an estimate, not an absolute.

"The fact is, accounting and finance... really are as much art as they are science," says Financial Intelligence, *A Manager's Guide to Knowing What Numbers Really Mean*. "We think that if a number shows up on the financial statements or the finance department reports to management, it must accurately represent reality. ...The art of accounting and finance is the art of using limited data to come as close as possible to an accurate description of how well a company is performing. Accounting and finance are not reality, they are a reflection of reality."^[8]

This need to approximate and estimate holds true for valuing transportation assets. Agencies' valuations always will be estimates. The key is for an agency to use a consistent valuation process comparable over many years.

The British code also emphasizes that assets with the highest costs merit the highest focus. As such, pavements and bridges that comprise more than 90 percent of a typical agency's assets merit the most sophisticated management while less complex assets such as signs merit less complexity.

A key difference in U.S. asset valuation guidelines and those in Great Britain or Australia is in the use of what is known as "historical costs" versus "depreciated replacement costs."

COMMON LANGUAGE FOR OPEN BOOKS

U.S. and Australian financial-reporting frameworks emphasize the use of common language so that a "reasonably knowledgeable" person could understand the agency's financial status.^[9,10] GASB 34 requires a manager's discussion and analysis (MD&A) that should give "an objective and readable analysis." Detracting from the asset management utility, the GASB 34 analysis is only required to relate to the past year.

The Australian guidelines emphasize an accrual accounting approach that summarizes the agency's long-term financial sustainability. It describes financial sustainability as "able to manage financial risks and financial shocks in future periods without having to introduce significant and economically destabilizing expenditure or revenue adjustments in those future periods...Effectively, a financial sustainability assessment involves a comparison of an agency's long-term financial capacity with its long-term financial requirements."

Despite their different timeframes, both sets of guidance emphasize common, understandable language to support public decision making.

The U.S. valuation process divorces asset condition from its value which is illogical to an engineer or planner. The British and Australian practices more closely relate asset value to condition resulting in much higher stated values. The U.S. valuation practice diminishes the utility of asset valuation as an asset management tool. First, the U.S. process of asset valuation will be described. Then, it will be contrasted to practices in other industrialized English-speaking nations.

U.S. Valuation Process

For the typical U.S. planner or engineer the valuation of an asset plays little role in deciding how to manage it. They instead focus upon asset condition.

State and local agencies annually report on asset valuation under the Governmental Accounting Standards Board Statement 34 (GASB 34) requirement. Transportation agencies generally produce internal estimates of their agency's infrastructure value that then are included as footnotes or tables in the statewide CAFR. The CAFRs tend not to be widely read and the asset valuation tables even less so. Generally, the agency's asset valuation estimates are a few lines of the CAFR table of capital assets along with other state capital assets such as parks, buildings, universities, and museums. A few paragraphs of explanation are included.^[11]

Most U.S. transportation officials report receiving little interest in the GASB 34 valuation estimates.^[12] This lack of interest is in part because they are published only in the relatively obscure CAFRs but also because the logic used to value assets is different from the logic used by engineers and planners to invest in assets. This is despite GASB 34's original intent to spur public review of the adequacy of infrastructure investment.

GASB 34 was adopted in 1999 at the same time that accounting bodies around the world increased their emphasis upon public-sector capital accounting. From the U.S. and Canada, across Europe and to Australia and New Zealand, accounting and financial professionals recognized that much of the public's "capital" was not reported in agency budgets and financial statements. Agency budgets

GASB 34 was adopted in 1999 at the same time that accounting bodies around the world increased their emphasis upon public-sector capital accounting.

reported upon current account balances and expenditures for a one or two-year period. However, physical capital was de-emphasized. An analogy would be to a homeowner balancing her checkbook and savings account but ignoring depreciation of her home, car, and retirement account. Her home

and car may represent her largest assets but they were not reported in her checkbook as capital assets whose value may increase or decrease. Similarly, agency financial statements ignored declines in highway and bridge conditions that represent loss of value in public assets.

Another analogy is between pension funds and transportation agencies. Pension funds hold many long-lived assets for many decades. They invest pension contributions in stocks, bonds, real estate and other investments to grow their portfolio for the benefit of the pension recipients who contributed to the system. The accounting reforms of the 1990s intended to put all government agencies on a somewhat similar footing to pension fund managers. The roads, bridges, buildings, and transit facilities owned by the transportation agencies reflected large investments as did the pension fund contributions. If transportation agency officials were managing a large infrastructure portfolio, they should report upon changes in its value. They also

should disclose their strategies and investments to grow, or at least to sustain, their portfolio.

In 1999, GASB 34 required for the first time that agency financial officials provide a “management discussion and analysis” summarizing the changes in the agency’s financial position regarding its physical capital or infrastructure. It also was to report on all costs, including costs such as the loss of infrastructure value through depreciation. Again, the analogy to a portfolio manager is relevant. If the stocks held by a pension manager decline in value, the pension fund would record the decline as a loss of portfolio value. Similarly, if an agency’s infrastructure portfolio declined in value through a lack of maintenance, that loss of capital value was to be recorded.^[13] GASB 34 summarized the intent as, “In short, the new annual reports should give government officials a new more comprehensive way to demonstrate their stewardship in the long term *in addition* to the way they currently demonstrate their stewardship in the short term through the budgetary process.”^[14]

The GASB 34 guidelines, however, specified asset valuation calculations that reduce their relevance to transportation asset management. GASB 34 requires agencies to value assets only based upon their original construction cost, known as their historic costs.^[15] As a result, a 30-year-old bridge that has been restored to near “as new” condition would be reported on the agency’s balance sheet only at its 30-year-old original cost. Also, many costs to maintain and restore assets are recorded as expenses, not as capital. As a result, a rehabilitation project that restores a bridge or pavement may not increase its reported value.

These guidelines tend to divorce an asset’s condition from its reported GASB 34 value. Under GASB 34, costs for electricity to light an office and the cost to rehabilitate a bridge are both expenses that don’t increase asset values, even if the

bridge is restored to nearly “as new” condition. Exceptions are brand new assets, such as a new bypass on new alignment. When complete, it is recorded at its construction cost. However, its value is not updated in later years when its components are rehabilitated. Thus, inflation erodes its relative value despite its condition.

Table 1 represents an example from the GASB 34 guidelines, with the years updated. It illustrates how the reported value of a serviceable asset would be reduced regardless of its condition. The original construction year was 2001, and the estimated cost to replace the asset in 2016 dollars is \$65 million.

Using FHWA construction cost indices, the 2001 construction costs are estimated to be 69 percent of 2016’s construction costs. Therefore, the estimated historic cost to build the asset in 2001 was the current value times 69 percent or \$44.8 million. Because the asset is assumed to have a 25-year life, one-twenty-fifth of its value is depreciated each year. By 2016, the 15 years of accumulated depreciation is \$26.9 million. That is subtracted from the estimated 2001 construction cost

Table 1. GASB 34 valuation example.

Step	Factor or Calculation	Value
A	Year Asset Constructed	2001
B	Current Replacement Cost	\$65M
C	2001 Construction Index (% of 2016 Costs)	.69
D	2016’s Estimate of the 2001 Construction Cost (B x C)	\$44.9 M
E	Annual Depreciation Cost Based on 25-Year Life (D ÷ 25)	\$1.794M
F	15 Years Accumulated Depreciation (E x 15)	\$26.9M
G	Recorded Asset Value in 2016 (D – F)	\$17.95
H	Years Remaining Until Asset Value = \$0 (G ÷ E)	10

leaving a recorded asset value of \$17.94 million on the 2016 financial reports. In subsequent years, the annual depreciation of \$1.794 is deducted resulting in the asset having a value of zero by 2025. Although the asset may have been maintained and rehabilitated, its value will continue to decline and reach a value of zero 25 years after its construction.

This use of “historic” costs tends to greatly understate the intrinsic value of U.S. infrastructure and makes asset valuation largely irrelevant to U.S. transportation asset management. From a narrow valuation view point, if an asset has no reported value, what is the imperative to maintain it? On the other hand, if the asset is reported as a high-value publicly owned piece of capital, the imperative to sustain its value increases.

Utah and Ohio Replacement Cost Examples

A comparison of GASB 34 asset values with estimated replacement costs illustrates how much the U.S. valuation standards reduce the reported value of assets. The Ohio DOT reports a GASB 34 value of \$2.893 billion for its bridges in 2014. Based upon its average square foot cost to replace or rehabilitate a bridge, it would cost \$32.9 billion to replace its bridge inventory based on 2014 costs. The GASB valuation equals 9 percent of replacement cost, although the agency bridges are in relatively good condition. ODOT reports that only 1.4 percent of its bridge area is in unacceptable condition. From a performance standpoint, their value is high. From a GASB 34 standpoint, their value is much less.

The Utah DOT estimates the replacement value for its roadway assets at \$34.6 billion, shown in Figure 1. By comparison, its GASB 34 values for pavements, structures and land are \$15.9 billion or 45 percent of the replacement cost. Despite depreciating replacement values by 55 percent by using the required GASB 34 valuation, the Utah DOT reports good asset conditions. It reports 99 percent of all bridges

and interstate highway pavements are good or fair. For non-interstate roads with more than 1,000 vehicles per day, 92 percent of pavements are good or fair. For routes with less than 1,000 vehicles a day 76 percent were good or fair and 24 percent poor.

The result of the U.S. standards is that the reported value or “carrying amount” of infrastructure is much less than for equivalent assets in Great Britain, Australia, or New Zealand.

“There is virtually no benefit to TAM if assets are valued at historical cost under the GASB 34 depreciation approach,” says the second asset management guide.^[16] This is because of the long-term effects of inflation that decrease the

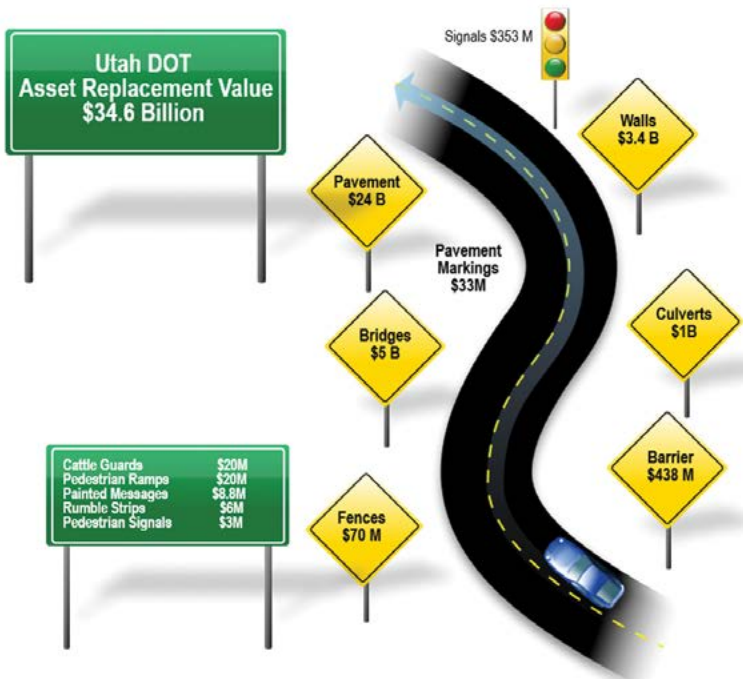


Figure 1. Utah DOT asset replacement values.

reported value of serviceable assets, according to the guide published by the American Association of State Highway and Transportation Officials (AASHTO.)

Using FHWA construction cost indices, the 2001 construction costs are estimated to be 69 percent of 2016's construction costs. Therefore, the estimated historic cost to build the asset in 2001 was the current value times 69 percent or \$44.8 million. Because the asset is assumed to have a 25-year life, one-twenty-fifth of its value is depreciated each year. By 2016, the 15 years of accumulated depreciation is \$26.9 million. That is subtracted from the estimated 2001 construction cost leaving a recorded asset value of \$17.94 million on the 2016 financial reports. In subsequent years, the annual depreciation of \$1.794 is deducted resulting in the asset having a value of zero by 2025. Although the asset may have been maintained and rehabilitated, its value will continue to decline and reach a value of zero 25 years after its construction.

“Unofficial” Use of Asset Valuation

Although GASB34 requires the use of historical costs for valuation of assets in the CAFRs it does not prohibit an agency's use of more realistic valuation estimates for planning, communication, or asset management purposes. The Utah DOT incorporates its much-higher asset-replacement costs into its risk-based asset management decision making. It uses the values from Figure 1 to both illustrate the value of its assets but to also help set investment priorities.^[20]

UDOT developed a tiered approach to managing its assets based upon their value and their risks. Tier 1 assets have the highest combined value combined with the highest negative risk of financial impact if they are poorly managed. These high-value assets receive the most sophisticated management that includes accurate and sophisticated data collection,

targets that are tracked, and predictive modeling and risk analysis. Tier 2 assets have a moderate value and risk and may have data collected less than annually, risks are assessed for failure only, and management may be by spreadsheet calculation rather than sophisticated model. Tier 3 assets have the lowest values and risks. They are generally repaired or replaced when damaged. Assets valued in Tier 1 or Tier 2 are managed for four categories of risks:

- Financial risks or the analysis of sustainable funding to achieve performance goals;
- Information risks or the availability and quality of data needed for long term management;
- Operational risk or the analysis of the probability and impact of asset failure upon the operation of the system, and;
- Safety or the analysis of risks to the impact on public safety of asset failure or poor condition.

Tier 1 assets are pavements, bridges, pipes and culverts. Tier 2 assets include retaining walls, barrier, signs, signals, pavement markings, rumble strips, intelligent transportation system (ITS) devices and curb ramps. The Tiers are broken down further with pavements stratified into the Interstates which are 16 percent of the system, Level 1 sections, or those with greater than 1,000 ADT and truck volumes above 200 daily. These comprise about 50 percent of its system. Level 2 pavements have less than 1,000 AADT and comprise 34 percent of the network.

Asset Valuation as an Investment Consideration

As with the Utah DOT, asset valuation plays a prominent role in asset management decision making abroad. The

high value of infrastructure assets is cited in British asset management plans as one of the rationales for effective asset management. Transport for London's first highway asset management plan in 2007 started by noting the plan will help the City of London manage its \$5 billion in roadway

GETTING ON THE SAME PAGE

By calculating an agency's asset values, transportation officials can relate to business-oriented citizens and elected officials by referring to the agency's "book value." When the total value of an agency's physical and financial assets is calculated, the total would be what business analysts call the "book value." Book value is a common business term that refers to the estimated value of a company if all of its assets were sold. It is a different type of valuation than income-generating valuation, or market value, that bases a company's estimated value upon the revenue it could generate in the future. Book value is calculated by estimating the value of plant, equipment, inventory, land, cash, and other assets that could be sold. Understanding a company's book value is a key factor for business owners.

With many legislators and governors coming from the private sector, they would understand book value from their business experience. By calculating and using book value as a decision-making tool, transportation agency officials can speak in a language that these former business people readily understand. Another term for book value is "owner's equity." By discussing owner's equity and book value, agency officials can demonstrate they understand that transportation infrastructure is owners' equity, and the owner is the public.

assets, which are among the most valuable assets owned by the City.^[21] The London asset management plan says that changes in asset values reflect changes in asset conditions, providing the city an important benchmark of its asset management effectiveness. It also can track its depreciation expenses against its asset investments to determine if it is keeping pace with asset deterioration. The London borough of Croydon's asset management plan says it uses asset valuation as one of several measures to track the condition of assets.^[22] Knowing the annual change in asset values

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helps the city determine investment levels to build a business case to ensure the network remains "fit for purpose." It compares its Gross Replacement Cost, or its as-new costs, compared to current, depreciated costs to determine how much network value has been lost to "consumption of the asset" or depreciation. Its

calculations indicate that current assets represent about 89 percent of "as new" value. This indicates that assets are in relatively good condition with only 11 percent of the assets "consumed" or depreciated. Although not stated in the Croydon asset management plan, this percentage has sometimes been called an Asset Consumption Ratio. It measures the percent of "as new" assets that have been consumed through use or depreciation.

The Town of New Market Ontario's asset management plan reports that the value of its infrastructure assets is immense in relation to the town's operations. It says in recent years the linking of the management of these assets to fiscal sustainability principles has become more prevalent. It prepared six strategic documents to guide its long-term operations

including a capital financing sustainability strategy, a roads needs study, and an asset management plan that covers all its infrastructure.^[23]

Canadian governments such as New Market must report historic costs on their financial statements, as do U.S. governments. However, New Market's asset management plan says the historic costs have limited value for making infrastructure investment decisions. Therefore, it also reports replacement costs which are more meaningful to decision makers. It notes its town hall was built in 1860 for \$60,000 but was recently renovated for \$9 million. Its roads and bridges are on the books for \$139 million in historic costs but are valued at \$323 million for replacement costs. "It is the replacement costs, the costs that will be incurred now or in the future, that are essential for decision-makers to be aware of." It bases its 10-year financial plan, which is called a Capital Financing Sustainability Strategy, upon the costs to renew and replace assets based upon their replacement costs.

The City of Sydney, Australia's, Resourcing Strategy provides a 10-year financial plan for the city which includes tracking of asset valuation and depreciation.^[24] Although it cautions that the amount of depreciation does not equate to any given year's maintenance needs, it does reflect the long-term reduction in the asset's estimated useful life. Depreciation of the value of the city's assets provides a benchmark against which its asset-renewal expenditures can be compared. It reports that its program for asset renewal and replacement over 10 years will match or exceed the assets' depreciation. As with other governments in Australia, the predicted depreciation appears as a line item on the agency's projected 10-year income statement. Depreciation represents about 20 percent of the city's expenses from continuing operations over 10 years. Depreciation averages \$124 million annually over 10 years while the city's projected capital plan averages \$186 million, outpacing the accumulated depreciation.

The Australian State of Victoria's highway agency, known as VicRoads, reported 2014 asset values of \$47.7 billion, which is more than twice that of Ohio's although Victoria has half of Ohio's population. The higher values result from Australia's reliance on what is called "depreciated replacement costs" rather than the historic costs used in the U.S. Depreciated replacement cost will be explained below. The VicRoads annual report reflects the private-sector-like accounting used in Australia. The agency reported a net deficit in 2014-15 in part because of a recognition of higher depreciation resulting from an every-five-year revaluation of its assets.^[25]

Depreciated Replacement Cost: Balancing Value and Depreciation

The British and Australian accounting guidelines call for agencies to report the "fair value" of assets, not the historic costs. As noted, this leads to higher and probably more realistic valuations than in the U.S. The Australian Accounting Standards Board Standard 13 defines fair value as the price that would be received to sell an asset in an orderly transaction between market participants.^[26] When estimating fair value, the organization shall take into account the characteristics of the asset such as its condition and location. Standard 13's inclusion of condition as a valuation factor significantly differentiates it from GASB 34 which focuses on only the original, or historical, construction cost. Australian Standard 13 also says that in the absence of a principal market—such as for publicly owned transportation assets—the fair value measure assumes that the asset could be sold in the most advantageous market. For non-financial assets such as infrastructure the standard says fair value should take into account the market participant's ability to generate economic benefit by using the asset at its highest and best use. Again, this provision allows the condition of assets to be factored into their value because the economic benefits can include the asset's remaining years of service.

For non-market assets, the entity shall consider all “relevant observable inputs” when valuing assets. This opens the door for asset conditions to influence the asset’s value.

The Australian Accounting Standards Board Standard 13 defines fair value as the price that would be received to sell an asset in an orderly transaction between market participants. When estimating fair value, the organization shall take into account the characteristics of the asset such as its condition and location.

Under the Australian accounting standards, different valuation approaches could be applied to different assets. The valuation process would depend upon how robust comparable price data are. The guidelines provide three different levels of valuation ranked in order of preference. Level 1 inputs would be used when there are quoted prices for comparable assets, such as if the agency owns excess rights-of-way whose value can be equated to comparable land prices. Level 2

inputs would be observable inputs, such as the price of an asphalt pavement resurface. The agency could not re-sell an asphalt surface to determine its market value. It could, however, estimate the cost or value of a pavement surface based on typical construction costs and the asphalt surface’s age and condition. Level 3 inputs are not observable in the open market but can be derived from an entity’s own data, such as asset-inventory condition data.

The agency also could use different valuation techniques depending upon the use of the asset. A market-based approach to valuation could be used for items that have comparable market prices, again, such as excess rights-of-way that could be sold. The agency could use an income approach for assets that generate income, such as the service plaza on a turnpike. The value of the service plaza

could be determined by the net present value of its income over a specific time period. The income-based approach is typical when private companies estimate the value of a business they want to buy or sell.

The third approach would be most typical for transportation assets and it is the cost approach. The cost approach reflects the amount that would be required currently to replace the service capacity of the assets, or as the Standard 13, says, the “current replacement cost.” The replacement cost, however, is not to an “as new” condition but rather to an “as is” condition. “From the perspective of the market participant seller, the price that would be received for the asset is based on the cost to the market participant buyer to acquire or construct a substitute asset of comparable utility, adjusted for obsolescence...Obsolescence encompasses physical deterioration, functional (technological) obsolescence and economic obsolescence...” For instance, an asset that no longer meets standard or which is technologically obsolete would have lower value regardless of its physical condition.

A definition very similar to current replacement cost is the depreciated replacement cost, or DRC.^[27] It is most commonly used to value assets in Australia and is recommended for adoption in Great Britain. Both have similar definitions but the depreciated replacement cost may have the more descriptive and less-ambiguous title. It is defined in AASB Standard 136 as “the current replacement cost of an asset less, where applicable, accumulated depreciation calculated on the basis of such cost to reflect the already consumed or expired future economic benefits of the asset.”^[28] In other words, what would it cost to replace the asset as it is?

Depreciated replacement cost addresses some of the shortcomings of GASB 34’s reliance on historic costs. As its name suggests, it captures both the cost to replace an asset “as is” and also reflects the reduced value caused by age and

depreciation. Table 2 which is modified from the Australian Infrastructure Financial Management Guidelines 29 illustrates an example of calculating a depreciated replacement cost. In the example, an agency determines the value of a 55-year-old bridge. It determines that the cost to replace the bridge with a modern equivalent will be \$3 million. The bridge has an expected life of 60 years, with five years remaining. Therefore, it has 8 percent of its remaining useful life or 5 years/60 years. The replacement value of \$3 million is multiplied by the remaining life, or 8 percent, to produce a depreciated replacement value of \$250,000. The 55-year-old bridge is thus carried on the books at a depreciated replacement value of \$250,000. If a new bridge is built in five years, it will be “recognized” on the books at \$3 million and the agency’s asset values will increase by that amount.

Table 3 (see next page) compares the value of the bridge if historic costs were used. In this scenario, it is estimated that the historic cost of the bridge was \$500,000 55 years ago. Because it has an estimated life of 60 years, one-sixtieth of its value is depreciated each year so that by the current time it has a value of only \$41,667, compared to \$250,000 in the depreciated replacement cost valuation. As can be seen, the major difference is applying depreciation to the replacement cost, not the historic cost. The Australian and British guidelines contend that the depreciated replacement cost provides

Table 2. Depreciated Replacement Cost Calculation.

Step	Factor or Calculation	Value
A	Cost to Build New Replacement Bridge	\$3M
B	Useful Life	60 years
C	Age of Bridge	55 years
D	Remaining Life	5 years
E	Percent of Remaining Useful Life (D ÷ B)	8.3%
F	Depreciated Replacement Cost (A X E)	\$250,000

Table 3. Historic Cost Calculation.

Step	Factor or Calculation	Value
A	Historic Cost to Build Bridge 55 Years Ago	\$500,000
B	Bridge Age	55 years
C	Estimate Bridge Life	60 years
D	Annual Depreciation (A ÷ C)	\$8,333
E	55 Years of Depreciation (B x D)	\$458,333
F	Bridge Historic Value (A – E)	\$41,667

a more realistic estimate of the actual value of the structure. In this case, the structure will provide 5 years of service, which in modern cost terms, is valued at \$250,000 and not the \$41,667.

The British asset management accounting guidelines also recommend depreciated replacement cost for valuing assets.^[30] It says that depreciation is a useful measure of the cost of the economic benefits of assets that have been consumed during the accounting period. However, applying depreciation to the historical cost of assets is not a good basis for dealing with assets that have long lives. The depreciation expense applied to the lower historical cost understates the amount of annual depreciation incurred, which understates the amount of investment needed to sustain asset values. It defines depreciated replacement cost as, “the current cost of replacing an asset with its modern equivalent asset, less deductions for all physical deterioration and all relevant forms of obsolescence and optimization.” The gross replacement cost (GRC) is the cost of constructing a modern, equivalent asset. From the gross replacement cost is subtracted depreciation to determine the depreciated replacement cost.

The British guidance has two other elements that increase asset values in comparison to values derived from historic

costs. First, the asset values are indexed upward each year to reflect inflation. Agencies should differentiate or track the amount of increased asset value caused by inflation so that they can recognize how much the value is increased by inflation and how much by investment.

Secondly, the British guidelines allow more increase in asset value through investment than does the U.S. standards. This is called “capitalization.” As investments are made to extend the life of assets, the asset value is increased more liberally under the UK guidelines than the U.S. guidelines. In the U.S., costs such as painting steel beams or replacing an asphalt layer are considered expenses that cost the agency but

The result of the British capitalization guidelines is to “reward” sound asset management. As investments are made to extend the life of assets, the agency’s asset values increase. The agency can demonstrate to the public and to policy makers that it is growing the public’s equity and acting sustainably.

which do not increase asset value. In most U.S. agencies, they only “capitalize” items that expand the size or footprint of assets. And they often have higher capitalization limits of \$500,000 or more. The result is that many U.S. asset renewal projects don’t increase asset values, which again is contrary to engineering logic. In the British guidelines, the capitalization limits are lower and more types of projects result in increased asset values.

The CIPFA guidelines say, “Put simply, the intention is to capture anything that adds to or restores the economic benefits and service potential of the asset compared to the condition at the time the expenditure is made.”^[31] Filling potholes or cleaning ditches are not capitalized but painting steel beams or sealing pavement surface layers are.

The result of the British capitalization guidelines is to “reward” sound asset management. As investments are made to extend the life of assets, the agency’s asset values increase. The agency can demonstrate to the public and to policy makers that it is growing the public’s equity and acting sustainably. It will be leaving for future users higher asset values and more public “equity” than currently exist. In effect, they have grown the value of the public’s transportation portfolio.

Asset Valuation as a Component of Financial Management

In the Canadian, British, and Australian infrastructure-management frameworks asset valuations are only part of a larger process to encourage state, local, and national governments to focus upon the financial sustainability of infrastructure. Asset values alone do not drive the infrastructure-management framework but are part of a suite of financial-sustainability metrics and analyses intended to support the long-term, responsible investment in assets. A more detailed discussion of Australian and British financial infrastructure plans can be found in the FHWA report, *Asset Sustainability Index: A Proposed Measure for Long-Term Performance*, pages 21-31, accessible at https://www.planning.dot.gov/documents/ASI_report/ASI_July9_FINAL_web.pdf Here, the financial-sustainability frameworks are summarized and the role of asset values put into the financial-planning context.

In most of the international examples, asset valuation complements typical asset performance measures and processes, it does not replace them. Officials still focus on pavement and bridge conditions, deterioration rates, and other asset-condition attributes. But the inclusion of asset values translates deteriorating infrastructure into depreciation that appears as lost dollars and cents to taxpayers.

In Canada, the Public Sector Accounting Group of the Canadian Institute of Chartered Accountants (CICA) produced for local governments a Guide to Accounting for Reporting Tangible Capital Assets.^[32] It's opening paragraphs reflect the sentiment seen in similar efforts in Great Britain, Australia, and New Zealand.

“There is growing evidence that our communities are facing major challenges financing deferred maintenance, renewal and replacement of aging capital assets. This may be an indicator that decision makers have not received sufficient information to understand the financial effects of past funding decisions on the condition of existing capital assets and the cost of using them in service provision.

As the existing capital asset base ages and population grows, increased demands for new capital assets will place further pressures on the ability of a local government to sustain those services. Information about the existing stock, the cost of its use and the needs for its replacement must be at the forefront of decision making. To be useful, that information must be complete, reliable and unbiased and provided on a local government-wide basis.

This is not to say that local governments have not been maintaining information about their assets to properly manage them. Municipal engineers have developed asset management systems for work management, customer care and capital budgeting. But those systems exist largely independently of the core financial systems. They are often specialized in nature, incomplete and not comparable within a local government itself, nor with those of other local governments.”

The Canadian guide says accounting standards can play a vital role in bridging the gap between asset management and financial management by bring capital asset information to the attention of the public and policy makers. It references “accrual accounting” which is a form of accounting that captures on financial reports the long-term assets and liabilities of an agency, not only the ones evident in the current annual or biennial budget. When assets and liabilities are accrued, future funding gaps and declines in asset values are highlighted and reported in the financial reports. The Canadian guidelines say that one of the main benefits of asset valuation, accrual accounting, and long-term financial reporting is to provide better information for management decision making.

Although not summarized in quite this way, the Canadian and other guidelines seek to bring to the attention of decision makers the long-term consequences on “public equity” of current investment decisions. When considering investments, decision makers such as local city council members or transportation agency commissioners could choose between building new assets or investing in the renewal of current assets. Investing in the new asset increases the government’s asset values, at least in the initial years. However, after a few years, the amount of total depreciation grows as the government’s asset base expands. Depreciation of the old assets continues and the newer assets begin to depreciate as well. Depreciation on the agency’s financial reports increase and leads to more long-term financial liability. If, however, the agency invests in improving the condition of existing assets, their value rises and total long-term depreciation costs decrease. The intent of the financial-reporting guidelines is, in part, to increase public recognition of the cost of depreciation. The capturing of depreciation puts a number, or a cost, before decision makers and allows them to compare that cost against the benefits of alternative investments.

Two financial-reporting practices bring this cost to the decision-makers' attention. First, depreciation appears on the financial reports as a negative value that decreases the agency's equity or value. Second, is the 10-year timeframe of the financial plan. It captures the increase in depreciation as assets age. If the agency focuses only upon short-term accounts, it can balance income and spending without showing a deficit. When depreciation is included, the decline in asset condition appears as depreciation that is evident to readers of the financial reports.

The need to capture the full effect of depreciation requires a long-term financial plan of 10 years because the increased depreciation caused by poor maintenance is not apparent in the short term.

The capturing of depreciation also serves to recognize on agency financial reports that "savings" don't exist from deferring maintenance. Short-term cash outlays may be reduced but long-term depreciation increases. The need to capture the full effect of depreciation requires a long-term financial plan of

10 years because the increased depreciation caused by poor maintenance is not apparent in the short term.

The Canadian accounting association notes that although financial statements themselves may not drive decision making, the larger process of integrating financial reporting with asset management planning can improve decision making. The decision-making process improves because of the effort needed to develop sound inventories, assess asset condition, and determine long-term investment needs.^[33]

The Canadian guidelines express sentiments similar to those of the U.S. Government Finance Officers Association published in its report, *Long-Term Financial Planning for Local Government*.^[34] It lists several key roles for financial planning to support strategic, long-term decision making including:

- Long-term financial planning should be central to governance and management, and not be a one-time event or staff tool;
- Financial planning supports elected officials' efforts to maintain financial discipline despite short-term political pressures;
- The linkage from the long-term financial plan to the short-term budget is critical;
- Financial planning supports elected officials' ability to "step back" from daily detail and see a strategic view of budgeting;
- Financial plans support elected officials' realistic understanding of how quickly financial stability can be reached, or long it will last, given the agency's financial reality, and;
- Financial planning can improve staff performance by keeping them focused on the agency's key priorities.

Another Canadian publication advises local agencies that accounting for assets helps them assess the long-term sustainability of debt loads, the sustainability of their infrastructure, and their financial resilience.^[35] If their community experiences high depreciation and debt levels, and low infrastructure conditions, it is less resilient and less able to respond to disasters or public requests for higher service levels. In effect, the community's assets are depleted and its financial reserves limited making it less resilient. The higher the asset value in relation to "as new" the more robust the community is. If disaster struck, the agency could forego years of investment without irreparable harm to its assets. On the other hand, an agency with poor asset conditions and fully depreciated assets has less "equity" to draw upon in times of emergency.

Complications of Transitioning to Depreciated Replacement Costs

Although valuation methods that rely on depreciated replacement costs may be attractive to the U.S. engineer or planner, transitioning away from historical costs faces challenges. To be officially accepted on financial statements, the use of depreciated replacement costs would need to be recognized by the Government Accounting Standards Board. GASB has not listed a change in capital accounting standards as an initiative.

Also, many state transportation agency financial officials are accustomed to the GASB 34 process and have routinized processes to estimate infrastructure values using historic costs. Changing to depreciated replacement costs or another method would present additional staff costs and reporting effort. It also could require restatement of past financial reports. Perhaps even more complex, state accounting system processes outside of the transportation agency may need to be changed. GASB 34 reports are incorporated into statewide reports for other state-owned assets such as buildings, universities, and airports. Changing the standards would not limit the impact to only states. Local governments would be affected as well.

In addition, many accounting professionals still advocate for historic costs as a valuation standard for capital reporting. Although the Canadian Institute of Chartered Accountant's *Guide to Accounting for and Reporting Tangible Capital Assets* strongly endorsed capital reporting as a sound public finance process, it still accepts the use of historic cost as the valuation basis.^[36] It acknowledges that arguments are raised against historic costs including:

- They do not present meaningful performance measurements in times of changing prices;

- The cost of using infrastructure should reflect current costs, not past costs, and;
- Replacement costs or depreciated replacement costs reflect the amounts that should be budgeted to replace assets.

However, the accounting body says because accounting is “transaction based” the primary measurement for both assets and liabilities is the value at the time they were acquired, developed or constructed. Historical cost accounting is objective and reliable, not dependent on uncertainties or estimates.

The Canadian Institute of Chartered Accountants and the Canadian Public Sector Accounting Handbook^[37] appear to provide some opportunity for increasing asset values based upon maintenance investments.

Although the financial statements may still rely on historic costs, those financial statement standards do not prevent an agency from including different valuation processes in its asset management plan, in budget testimony, or in other communications to the public and policy makers. Just as do the Utah DOT and the Ontario community of New Market, agencies can calculate total replacement cost, depreciated replacement costs or other values and use them for programming, project-selection, budgeting, and communication efforts.

Although the original value of the asset is fixed by its historic cost, the rate at which it is depreciated could be affected by the maintenance investment it receives. So although the beginning value of the asset would not be increased, the useful life of the asset could be extended which has the effect of reducing the annual amount of depreciation. This practice could allow a government agency to demonstrate financially through decreased depreciation the benefits of asset management.

Although the financial statements may still rely on historic costs, those financial statement standards do not prevent an agency from including different valuation processes in its

TRANSLATING PRIVATE SECTOR DEPRECIATION TO THE PUBLIC SECTOR

The application of generally accepted accounting practices (GAAP) to public sector capital assets in the 1990s was viewed as a “good government” reform.^[38,39] It put the issue of asset depreciation and sustainability clearly into agency financial statements.

However, transferring private-sector depreciation practices to long-lived public infrastructure creates some challenges. In the private sector, assets are depreciated for two major reasons. One relates to tax write offs. The government encourages capital investment by allowing companies to depreciate assets. If a company depreciates a piece of equipment over 10 years, it deducts a tenth of the cost of the equipment from its revenue each year, reducing its tax burden. Also, the depreciation of privately owned assets reflects their obsolescence. A company is worth less if its assets are old or outdated, and modern equipment can become obsolete in just a few years.

In the public sector, depreciation schedules for tax write offs are meaningless. Also, a bridge or roadway may be 100 years old but still not be obsolete, such as the Brooklyn Bridge. The Australian and British use of Depreciated Replacement Cost is an attempt to find a depreciation process that captures depreciation but complements transportation asset management.

asset management plan, in budget testimony, or in other communications to the public and policy makers. Just as do the Utah DOT and the Ontario community of New Market, agencies can calculate total replacement cost, depreciated replacement costs or other values and use them for programming, project-selection, budgeting, and communication efforts.

Reporting Under GASB 34

Although GASB 34's requirement to use historic costs may have diminished the U.S. focus on asset values, GASB 34 did stimulate ongoing reporting of how much agencies invest in assets and whether those investments are sustaining asset conditions. When the GASB 34 standard was under discussion in the late 1990s, some government officials raised the shortcomings of historic asset values. The accounting standards board responded by giving governments two options. Both options require use of historic costs for valuing assets. However, agencies could adopt the "modified" approach that does not require a reporting of depreciation. Instead, they can use their asset management systems to document that they are sustaining asset conditions through annual investments. The alternative would be to report their annual depreciation and demonstrate that asset investments are offsetting the depreciation and sustaining asset value.

A survey by AASHTO's Subcommittee on Financial Management and Accounting in 2012 ^[40] found that of 22 responding states, 13 reported using the modified approach and the remaining report depreciation in their CAFRs. For states that report depreciation, their report in the CAFR generally consists of a few lines of how much depreciation was estimated in the past year compared to the amount spent on infrastructure.^[41] Few details are included and the report is limited to the past year.

States that use the modified approach must have an asset management system that meets the following GASB 34 conditions.

- They have an updated inventory of eligible assets.
- They perform condition assessments and summarize them on a measurement scale.
- They estimate each year the annual amount to maintain and preserve the eligible assets at the targeted condition level.
- They document that the assets are preserved at approximately the target condition level.

An example of a modified report is seen in the Florida CAFR for the Department of Transportation.^[42] It reports the department commits to maintaining its assets at the levels established by the Florida Legislature. The department maintains an asset inventory and performs periodic condition assessments to document that condition targets are met. In addition, it estimates the amount needed to maintain the assets and budgets accordingly.

In the Utah CAFR three pages summarize the DOT's highway infrastructure investment reporting. It notes the department sets targets for pavements and bridge, which it exceeded in 2010, 2011, and 2012. Similarly, its estimated spending for the preceding four years exceeded the amounts needed to sustain the targets.

Despite the brevity of the asset valuation and asset-investment discussion in the two CAFRs, both departments provide extensive asset management information on their web sites that extensively explain their asset conditions, their expenditures, and their efforts to sustain their assets. The contrast

between the limited information in the CAFRs and the extensive information on their asset management websites demonstrates how in the U.S. the asset valuation process plays little role in managing assets.

No comprehensive study of the effects of GASB 34 on U.S. transportation agencies has occurred since 2008.^[43] That study found that four years after GASB 34 was fully implemented in 2004 it had devolved to a routine administrative task. Agencies studied reported little interest in the information from outside bodies such as legislators, the investment community, or the general public. A positive outcome was that the financial information and asset management information was more integrated than before.

Potential Uses of Valuation

Typically, accounting data are not thought of as material for communicating with the public. However, an old newspaper saying is that, “there are no boring topics, only boring presentations.” There are examples of how asset values and depreciation have been used to communicate to the public the need for infrastructure investment.

The City of Melbourne, Australia’s, Asset Management Strategy 2015-25 ^[44] is a colorful, 31-page report with minimal text and ample maps, charts, tables and drawings. A two-page wide illustration represents a cross section of a typical urban street lined with community buildings, sidewalks, curbs, landscaping, street lights, and pavement. The cross-sectional drawing also illustrates underground assets such as the road base, drainage structures, and water systems. Associated with each category of asset is its value. The illustration notes the community owns \$424 million worth of road bases, \$43 million worth of pavement surfaces, \$93 million worth of bridges, \$176 million worth of curbs, and \$177 million worth of sidewalks and footpaths. It even estimates the

value of landscaping, street furniture and irrigation systems. Accompanying each asset value is a red, yellow, or green summation of its condition.

The city's mayor's introduction to the asset management plan notes that Melbourne has been named the world's most livable city for the fifth year in a row. To preserve its livability, it needs to strategically preserve its \$3.5 billion in assets in the face of a rapidly growing population, a changing climate, and rising costs, while constraining tax growth. The strategy includes not only efforts to maintain assets but also to improve the asset data to better communicate with the public.

The asset management plan says that in almost every case city services are delivered through a physical asset such as a street, building, or park. Services such as providing child care or supporting the elderly often depend upon adequate child-care or senior centers, and sidewalks, curbs, and parks that meet the needs of everyone, not just the abled-bodied.

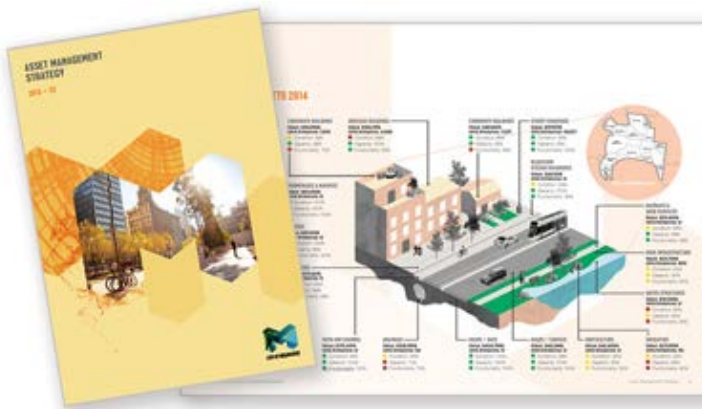


Figure 2. The City of Melbourne, Australia's, Asset Management Strategy 2015-25. SOURCE: CITY OF MELBOURNE

The asset management strategy emphasizes the value of the community's assets and how they provide community benefits. It notes it costs about \$364 million annually to operate the \$3.5 billion in assets, and that over the past 10 years annual depreciation has been about \$44 million annually. The plan uses everyday language to explain that capital assets are physical objects that provide service to the public. To maximize the value of these assets for up to 100 years it is necessary to preserve and invest in them. The strategy refers to the city's physical assets as a portfolio with a combined value of \$3.5 billion that has grown on average 5.9 percent for the past decade. A line drawing illustrates the concept of depreciation and notes that asset values increase through proper design, materials, construction and maintenance but depreciate through use, climate, conditions, and market forces.

The plan calls each asset a "touch point" for providing service to the community. Because of their importance, each asset is assessed for its condition, functionality, and capacity. The plan also emphasizes the future strategies and expenditures needed to sustain these service-providing assets.

The asset management strategy is accompanied by a 10-year financial plan that provides the city with a long-term sources and uses financial statement.^[45] Included in the 10-year financial plan is an annual estimate of asset depreciation. It begins in 2015-16 at \$59.7 million and grows to \$89.5 million by 2024-25. This line item approximates the amount of investment needed to sustain assets at current values. The financial plan was developed with a community involvement panel called the People's Panel. The panel recommended and the city agreed to reduce emphasis upon building new assets and to increase emphasis upon sustaining current assets. This was adopted after forecasts indicate that future revenues would grow only moderately but that annual expenditure growth of 4.6 percent was needed to

sustain asset conditions. This growth rate was predicated on 2.6 percent annual inflation plus a 2 percent real growth rate for a 4.6 percent annual asset-investment increase.

The City of Sydney council reports \$8.5 billion worth of physical assets. It's financial plan and its asset management plan ^[46] includes 10-year strategies and investment levels for major asset classes such as the road network, storm water assets, parks and open space, and property. For each, 10-year-trend lines of investment levels compared to investment needs are forecast.

Guidance for municipalities in Ontario, Canada, says municipalities need to face the replacement value of assets as a consideration in annual budgeting.

Canadian guidance for municipal asset management also recommends that communities value their assets and emphasize the need to sustain them as valuable community assets. A British Columbia local government asset management framework

says the reporting of asset values is important to asset management planning, financial planning, and public communication.^[47] It includes calculation of depreciated replacement costs as one of the core elements for decision making. It also advises that annual budget deliberations be informed by asset renewal alternative options. It also argues against using historical costs and says assets should be depreciated using replacement costs. Those costs should become an integral part of the community's financial planning. One anecdote included in the guidance says that the City of Prince George became more aware of the need for asset management when it calculated the replacement cost of its assets and realized their "if new" value was \$2.3 billion compared to the \$810 million it had been reporting as their historic costs. The size of the investment and the recognition of significant maintenance backlogs spurred increased asset management efforts.

Guidance for municipalities in Ontario, Canada, says municipalities need to face the replacement value of assets as a consideration in annual budgeting.^[48] An accrual approach based upon replacement costs puts into the annual budget framework the need to invest annually to offset the depreciation in the replacement costs of its assets. When a community understands the magnitude of its asset replacement costs and realizes those costs are not in the infinite future but impact incrementally each year, it spurs adequate, annual infrastructure investment levels. Asset management financial planning emphasizes a forward-looking approach to the community's financial sustainability.

Asset Valuation and Depreciation Performance Measures

Among governments that emphasize asset valuations, performance measures exist for incorporating them into performance management systems. Several state governments in Australia require local governments to report their financial sustainability metrics, and to forecast them 10 years into the future. They provide additional insight into the sustainability of the governments, and the governments' assets. Definitions for these measures vary around the world with some agencies using the same name for a measure but calculating it differently.

The Austroads *Guide to Asset Management* Part 8 includes as financial sustainability performance measures the Asset Sustainability Ratio, the Asset Consumption Ratio, and the Future Renewal Funding Ratio.^[49] Austroads is the association of state transportation agencies in Australia and New Zealand.

Its Asset Sustainability Ratio differs from the U.S. version. The Austroads sustainability ratio is a ratio of current asset replacement expenditure relative to depreciation for a

period. It would be calculated by dividing the amount spent on asset renewal and replacement for a given period by the amount of asset depreciation. The Austroads sustainability ratio calculation is dependent upon having sound asset valuations and credible depreciation. The depreciation provides the denominator which divides into the renewal and replacement budget to calculate the ratio.

The Austroads Future Renewal Funding Ratio is nearly the same as the FHWA Asset Sustainability Ratio. Both divide the amount budgeted for asset renewal and replacement for 10 years by the amount called for in the agency's asset management plan.

Also relying on asset valuations is the Asset Consumption Ratio. Austroads calculates it by using the Current Replacement Cost as a denominator and dividing its value into the Depreciated Replacement Cost. This divides the “as is” value by the “as new” value. If the depreciated “as is” values are substantially less than

the “as new” cost to recreate the assets, the ratio will be low. Austroads says that an indicative target level could be between 40 percent and 80 percent. In other words, an agency would forecast asset renewal and replacement investments so that its assets remain for the next decade at a given percentage of their “as new” value of somewhere between 40 percent and 80 percent. Trying to keep them above 80 percent “as new” value could lead to over investment. Values below 40 percent of replacement costs could indicate under-investment. Judgment is needed for an agency to determine the optimal consumption ratio.

The Austroads Future Renewal Funding Ratio is nearly the same as the FHWA Asset Sustainability Ratio. Both divide the amount budgeted for asset renewal and replacement for 10 years by the amount called for in the agency's asset management plan. Assuming the asset management plan

identifies a credible amount of investment to sustain asset conditions, that amount of “need” is divided into the amount budgeted. If the budgeted amount is less than what is needed to sustain conditions, the ratio will be below 1.0 indicating a gap in investment levels.

Most of the Australian states have relied on these types of measures for the past decade. From one of many Australian examples, the City of Sydney forecasts a related series of financial metrics in its 10-year asset management and financial plans. It calculates and reports on a Building and Infrastructure Asset Renewal Ratio which is the annual renewal expenditure divided by the amount of depreciation.^[50] This makes it similar to the Austroads Asset Consumption Ratio. The city projects a 10-year trend for this ratio that indicates in 2013/2014 the ratio is about 1.30, indicating more than adequate investment to offset depreciation. The ratio slips below 1.0 by 2016/2017 before rising above 1.0 again in 2021/2022 through 2024/2025. The dip occurs in years in which the city has an aggressive capital-expansion program. The forecasting of depreciation and the forecasting of asset renewal levels allows the city to illustrate that it plans for adequate long-term investment to offset depreciation and sustain its asset values.

Although not dependent on valuations, Sydney also reports two related metrics. It forecasts for 10 years its Infrastructure Backlog Ratio which is the amount estimated to restore assets to satisfactory condition divided by the total value of the infrastructure. It forecasts ratios of less than 3 percent through 2024/2025. It also reports on an Asset Maintenance Ratio that compares the maintenance need by the planned maintenance expenditure. All are leading measures that forecast future performance and are not lagging measures that look at past performance.

Monitoring the measures such as these allowed the State of New South Wales to determine that a substantial number of

its predominately smaller local governments were not operating in a financially sustainable manner.^[51] A report included an assessment of the degree to which local governments are operating in a fashion that will sustain their infrastructure, and other essential services. It defined sustainability as, “A local government will be financially sustainable over the long term when it is able to generate sufficient funds to provide the levels of service and infrastructure agreed with its community.” By reviewing the local government’s asset management and financial plans, the report determined that 74 percent of the local governments were in a moderate or better position, but 26 percent are weak or very weak. Among the principal weaknesses were first-generation asset management and financial plans that fail to adequately provide the needed investment levels to sustain their physical assets.

Despite the substantial problems found in a large minority of local governments, the New South Wales report found that the state’s financial planning and asset valuation requirements had a positive effect overall on local governments. It says the local governments are more cognizant of long-term needs and not only focus on the next 12-month budget period. It also said the asset management plans require the local governments to consider whole-life costs of their assets, and have highlighted the underspending on maintenance. The New South Wales report categorized all the local governments and assessed them by 10 financial sustainability metrics.^[52] Four of those metrics relate to infrastructure investment. From the analysis, the state government could assess how sustainably the local governments are.

Steps to Update Asset Valuation

If U.S. transportation agencies were to collaborate to update the asset valuation processes the experience of their counterparts in Great Britain and Australia provide a precedent.

In both nations, associations of accounting professionals and transportation professionals collaborated to develop financial reporting guidelines that both support and build from transportation asset management practices.

In Australia and New Zealand, the Institute of Public Works Engineering Australasia is the association that supports local government infrastructure managers, similar to the function of the American Public Works Association. Austroads is similar to AASHTO by representing state transportation officials in Australia and the national transportation agency in New Zealand. The accounting and transportation officials in Australia collaborated to first produce asset management manuals. The one for local governments is known as the “double I double M” or the International Infrastructure Management Manual (IIMM.) Austroads produced for state governments the Guide to Asset Management. Included in the Austroads guide is a chapter on asset valuation and audit.

The IIMM financial management guide represents about three years of collaborative effort between Australian engineers and accountants. The IIMM financial guidelines exceed 300 pages, and sections of them are quite detailed. This reflects the different audit and review requirements in Australia, and the complex asset ownership practices. In several Australia states the requirement that local government asset management and financial management plans be audited leads to a need for more detailed accounting and asset valuation standards. Also, the Australian standards apply to all physical assets owned by local governments including water systems, hospitals, parks, and buildings, as well as highways.

The British local government asset valuation standards for highways are less complex. They reflect a first-generation effort that recognizes many local governments will not have sophisticated asset management systems. It advises that

DIFFERING DEFINITIONS OF VALUE

When discussing asset valuations, agency officials may want to clarify how they define value because many other disciplines use the term “value” differently.

For instance, the U.S. Bureau of Economic Analysis estimated the value of U.S. streets and roads in 2011 at \$3.132 trillion dollars.^[53] BEA does not, however, base this estimate upon inventories of roads and bridges. Instead, it bases its estimate upon a “perpetual inventory” method.^[54] This calculates the estimated amount of cumulative investment made. It estimates the amount of investment made in the past year and adds it to the cumulative estimates of past years, minus depreciation. The perpetual inventory method used by BEA is very different from the depreciated replacement cost method described here. However, the perpetual inventory method does attempt to capture the value of past investments and only partially relies on historic values.

Economists also can define infrastructure value as a measure of the difference infrastructure makes to businesses, consumers, and the nation.^[55] The value is based on the net contributions to society and economic activity. Under economic theory, some transportation facilities could have negative values. The externalities of noise, pollution, community separation or reduced property values would be deducted from transportation value.^[56] Although these methods are valid for economic analysis, they do not lend themselves to transportation asset management and hence are not captured in the British or Australian asset valuation processes.

local governments begin reporting asset values based upon their asset inventories, even if their asset management systems are incomplete. It recommends “beginning with what you have” and iteratively improving the asset-valuation data as the asset management systems improve.

It recommends a tiered approach to valuing an agency’s assets based upon the completeness and complexity of its asset inventories. It recommends dividing assets into three levels. Level 1 is quite general and includes only the broad categories of roadways, sidewalks and paths, structures, lighting, roadway “furniture” or roadside assets, traffic management systems, and land. Within each level would be more details, such as for pavements they could be broken down further into square meters of area, flexible pavements, rigid pavements and composite pavements. Units costs could be estimated for each based upon general estimates, if that is the only data the agency has.

However, if the agency has more detailed data it can use them to develop more refined asset values. For pavements, the additional detail could consist of inventory data such as pavement layers, surface condition, earthworks, embankments, medians, curbs, drainage structures or barrier. If the agency has this more detailed data, it can develop more refined unit costs for each component. For instance, the miles of barrier could be multiplied by the barrier unit cost to determine total barrier values. The unit costs would be based upon the cost to replace such assets. Their depreciated replacement cost would be calculated by multiplying the number or size of the assets times their replacement cost minus their depreciation.

The British valuation guidance takes a step toward basing asset values upon their condition, at least for pavements.^[57] It notes that many agencies will not have the historic costs of pavements. They were built over many years and the records

The British valuation guidance takes a step toward basing asset values upon their condition, at least for pavements.

for what each costs may not exist. For pavement surfaces, it produces a conversion calculation that converts the asphalt surface condition into an

age equivalent. From the age, the amount of depreciation from an “as new” condition can be estimated.

The Canadian experience provides some analogies for the use of depreciated replacement cost in the U.S. Like with GASB 34, the Canadian accounting rules require use of historic costs. That, however, has not stopped agencies from estimating their replacement costs and depreciated replacement costs and using those estimates for communicating to decision makers. The New Market, Ontario, asset management analysis is similar to the Utah DOTs in that both emphasize outside of their financial statements the high value of their assets and their need to sustain them. Although GASB 34 requires historic costs, it also requires a management discussion and analysis that could bring in depreciated replacement costs for comparison. Also, depreciated replacement costs could be cited in budget testimony, asset management plans, and other key communication documents.

3. Summary and Conclusion

Transportation agency officials are acutely aware of the public’s and legislators’ insistence that agencies conserve public resources. However, most times this insistence relates to preserving tax receipts, or employees’ labor costs, or agency equipment. By emphasizing asset valuation and depreciation, agency officials can demonstrate that depreciation and impairment consume public resources as well.

“Doing nothing” costs money. The declining value of the infrastructure through depreciation and impairment reduces the public’s “owner’s equity.” Unless depreciation is captured and reported, this loss of equity is hidden, or is “off the books.” Documenting depreciation, and demonstrating that asset renewal and replacement offsets it, allows an agency to demonstrate it is increasing the state’s owner’s equity.

Sound asset management allows an agency to document that it is lowering depreciation rates and conserving the public’s equity. A vigorous bridge or pavement preservation program can extend asset life which decreases the amount of depreciation that an asset experiences. By discussing the role of sound asset management in extending asset life and decreasing depreciation, an agency can demonstrate that it is not only providing a higher level of service but also helping to preserve the public’s massive investment.

Discussing asset conditions in terms of asset values may not resonate with every member of the public. Some may be reached more effectively by discussing the number of potholes that will occur under a given investment level, or how more bridges may be load-limited. However, for members of the public with some accounting or business backgrounds discussing book value, owner’s equity, or fair value will resonate. To them, it can communicate that the agency understands that it needs to manage not only its short-term cash assets but also its long-term tangible capital assets. Growing the owner’s equity is a primary objective for the corporate CEO. Discussing infrastructure in terms of book value allows the transportation agency executive to demonstrate “they get it” and know that they too are tasked with growing the public’s wealth.

However, it takes money to save money. To preserve asset values requires timely investment in asset renewal and replacement to offset depreciation and impairment.

Capturing depreciation allows an agency to demonstrate that savings may not occur when maintenance budgets are cut. Cash may be saved but owner's equity is lost.

Discussing asset replacement costs or depreciated replacement costs also allows an agency to demonstrate that the state's infrastructure is its largest capital investment. The value of the state's infrastructure probably rivals the value of its pension funds. Because pension funds report their valuation, their appreciation, and their depreciation, regulators can monitor the increase or decrease in critical pension-fund balances. From those balances they can forecast if assets will be sufficient to meet future pension needs.

Similarly, by translating infrastructure depreciation into financial terms, agencies can forecast if current investments will be sufficient to sustain future conditions, and future value.

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