PS 3150: Implications for Infrastructure Valuation, Accounting and Management

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Paper prepared for presentation
at the Pavements Session
of the 2007 Annual Conference of the
Transportation Association of Canada
Saskatoon, Saskatchewan

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Abstract: The Canadian Institute of Chartered Accountants (CICA) introduced PS 3150 Tangible Capital Asset to encourage the valuation and amortization of long-lived municipal infrastructure. Although based on a historic cost valuation method, PS 3150 is intended as a first step to support appropriate accounting and management of infrastructure assets. In this paper, the authors briefly discuss the broad aim of asset valuation, the basic approach of PS 3150 in this regards, and two case studies intended to illustrate the valuation and amortization method advocated in PS 3150. The authors are careful to distinguish between the needs of financial accountants, on the one hand, and financial managers, on the other hand.

Economics and asset valuation

Economic theory insists that the goal of any economy is to optimally allocate its available resources – land, labour, materials, equipment, et cetera – across innumerable competing needs. The logic is straight-forward: if society commits resources to some set of activities while better opportunities lie in wait, it is simply hurting its long-run economic success.

In terms of publicly-held civil infrastructure and related decision-making, this logic is reflected in three principal (and practical) methods of economic assessment:

- *Cost-benefit analysis (CBA)*. The purpose of CBA is to compare the direct costs of proposed infrastructure investments, policies and/or programs against direct, estimated dollar-valued benefits (Townley 1998). Of the options selected for study, the one posting the highest net present value (NPV, the difference between estimated discounted benefits and costs over some pre-determined planning horizon) is typically recommended for implementation. Application of CBA to broad questions of infrastructure policy and investment is widespread and has a long history.

- *Life cycle costing (LCC)*. LCC is often used to compare the projected costs of engineering design and/or management options over the expected service life of the infrastructure components or systems in question (Christensen et al 2005, Fabrycky and Blanchard 1991). Like CBA, the method is comparative. The option posting the lowest expected LCC (frequently valued in annual or present worth terms) is typically recommended for implementation. It should be noted that LCC implicitly assumes that variation in user costs across considered options are either: (i) negligible (in which case the analysis can focus solely on agency and any so-called external costs), or (ii) vary sufficiently to include in the costing process yet do not warrant the more careful and economically defensible accounting of CBA (i.e., the experience of users are reflected as costs rather than economic benefits).

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- *Cost-effectiveness analysis (CEA)*. CEA is used where the translation of, for instance, infrastructure performance is difficult to translate to some dollar-valued equivalent (e.g., user cost or benefit estimates). In this case, the effectiveness-per-dollar of alternative infrastructure design or management options are compared to determine which might be best for some pre-established function. Some infrastructure asset management systems (IAMS), for example, seek a maintenance schedule that maximizes expected performance gains (however measured) against the treatment costs incurred (Lytton 1987). See English 1968 for an overview of CEA and relevant examples.

Since IAMS are ostensibly employed to improve the efficiency with which engineers manage existing infrastructure components and systems, they frequently employ some variation of these basic economic methods to develop rational maintenance strategies (Irrgang and Maze 1993). Typically, it should be noted, these criteria are subject to some range of constraints within the embedded prioritization or optimization procedure. These can include minimum acceptable performance and resource constraints (e.g., budget monies, crew constraints, etc.) among others.

In any event, employed appropriately within a public infrastructure agency, these economic tools – and their expression within formal IAMS – help engineering managers recommend good policy, investment, rehabilitation and maintenance programs to elected officials who in turn then are in a position to make good decisions on society's behalf. In this context, it is the elected official's responsibility to make the decision with respect to the appropriate level of service to be provided. The net effect of this is that the general public can be reasonably confident that the infrastructure assets on which they depend are being well-managed from an economic standpoint and, therefore, that their tax dollars are being well-spent.

If this is indeed the case, then what do we need with valuation? In other words, if the tools used to manage infrastructure assets demonstrate good decision-making practices (including, for example, defensible budget-needs forecasts), then why bother going through the pain and effort of placing some definitive 'book value' on the assets themselves? There are two basic reasons: (i) effective communication of needs, and (ii) reciprocal impact on decision-making.

The first reason for valuation is apparent. If public sector accountants and citizens external to infrastructure departments have no accessible, quantitative measure of asset valuation and its change over time, how are they to judge the quality of the decisions reached? And if they can't 'see' the effectiveness of infrastructure decisions in public accounts, why would they support adequate funding for infrastructure maintenance and renewal? Communication of 'good works' through appropriate valuation procedures, then, is essential to gain the confidence and support needed to approve adequate funding of infrastructure over time.

The second reason for asset valuation (i.e., its reciprocal impact on decision-making) can be illustrated by example. Infrastructure agencies typically employ a fleet of vehicles and equipment to conduct their operations. To optimize replacement cycle decisions in the context of their operations and needs, it is essential to gain some appreciation of the corresponding salvage values. In this case, an obvious valuation choice would be a fair market value (FMV) assessment since, presumably, the bulk of vehicles and equipment can be sold to interests outside the agency (see Arnekudzi et al 2003 and Cowe-Falls 2004 for detailed reviews of alternative asset valuation methods). Hence, a FMV valuation would help managers decide when the best time is to replace vehicles and equipment within their fleet.

In contrast, a FMV approach to valuation would prove fruitless for, say, 'un-tolled' highways. Absent the ability to generate revenues for use, no one would pay a dime for highways. Does this mean highway facilities are worth nothing? Obviously not. As long as a highway continues to provide a valued service to users and presuming the infrastructure agency plans to maintain the asset for many years to come, some means of valuation is required to support rational management decisions. In this case, a reasonable measure of value might be a facility's written-down replacement cost (WRC) – a method advocated for use in New Zealand's asset valuation and depreciation guidelines (NAMSG 2006). Since WRC accounts for both the asset's deterioration over time and its current cost of replacement, infrastructure managers have a rational way of determining, for instance, whether or not to replace the asset in the near future or continue to maintain acceptable performance in order to extend its life and postpone replacement for some time. Armed with WRC, therefore, engineers can make rational management decisions in the context of both on-going costs and appropriate asset valuation at any point-in-time.

Background to PS 3150

The recently published guide to PS 3150 Tangible Capital Asset implementation (CICA 2007) acknowledges the beneficial influence appropriate valuation can have for both communication and decision-making, and advocates a particular method of valuation. It serves well, therefore, to briefly review PS 3150, its context and basic workings.

The recent PS 3150 Tangible Capital Asset public sector accounting rules apply to all municipalities in Canada. Compliance with the new rules must be met by January 1, 2009. In effect, PS 3150 insists that all municipalities move toward full accrual accounting of long-lived tangible infrastructure supporting their operations. Until compliance is reached, the cost of even long-lived assets can be (and have been) 'expensed' in the year they are incurred (Sparks 2007). Recognizing that this effectively misrepresents the value that infrastructure assets continue to provide over a long service life, the Canadian Institute of Chartered Accountants (CICA) created PS 3150 to appropriately amortize publicly-held assets (or their individual components) based on original costs and pre-determined planning horizons. However, since the planning horizon for any asset may be affected by numerous factors (e.g., extended through betterments or shortened through functional obsolescence), PS 3150 explicitly permits some flexibility to increase or decrease the estimated service life of the tangible asset in question. It is important to note, however, that any adjustments made apply only to the planning horizon at the current, amortized book value. In other words, while it is permissible to alter the planning horizon, it is not permissible to alter the book value in a way that effectively adjusts the historic cost of the original asset (or its components) when installed. The only exception to this general rule is where the use of an asset is impaired for some reason. In this case, it is permissible to write-down the book value of the asset (CICA 2007, 28-29).

The PS 3150 guide is careful to distinguish between the needs of financial accountants and financial managers in the context of asset valuation. The purpose of financial accounting is, literally, to account appropriately for monies already spent – not for monies that might be spent in future. Financial management, in contrast, exists to plan rationally for future expenditures to ensure required funds are available when needed. So while the historic-cost basis for valuation advocated in PS 3150 suits the needs of financial accountants, the guide acknowledges that alternative valuation procedures may be required to support the needs of financial managers. Nonetheless, the guide argues that a historic-cost basis provides a consistent, verifiable starting point to assist the derivation of alternative asset valuations that help managers reach good decisions and communicate their needs to others (CICA 2007, 16-18).

Case studies

Two hypothetical case studies are used to illustrate the basic workings of PS 3150. The first case study involves a paved road segment where historic costs are known. The second case study involves a water main segment where historic costs are unknown. Both cases demonstrate the amortization schedule derived through reasoned application of PS 3150.

Historic costs known: a paved road segment

Consider a one-kilometre paved road segment whose original construction required purchase of right-of-way (ROW) and capital expenditures related to materials and placement of sub-base, base (collectively, the 'road structure') and asphalt concrete (AC) pavement surface. Since ROW is, effectively, infinitely-lived, it is not subject to amortization under PS 3150 (note that PS 3150 permits some latitude with regards expenditures included or not within amortization schedules). The tangible capital components of the roadway, however, are subject to amortization under PS 3150. Although maintenance efforts and costs (e.g., pot hole repairs, spot seals and crack filling) are incurred to adequately support acceptable performance over the roadway's expected service life, they are generally expensed in the year incurred and do not fall, therefore, under PS 3150.

Table 1 summarizes relevant amortization data for the paved road segment of interest. In this case, the ROW was purchased in 1980 for a cost 10,000 dollars per kilometre and – as indicated above – is not subject to amortization. Road structure components of the roadway (i.e., base and sub-base) were placed in 1990, cost 250,000 dollars per kilometre, and are amortized over 40 years on a straight-line basis. The corresponding cost of the pavement surface is treated in the same way as the road structure, yet is amortized over a period of only 15 years.

Table 1. Amortization data for paved road .

Capitalization category	Amortization period (years)	Amortization method	Year acquired or constructed	Cost ($/km)
Right of way	n/a	n/a	1980	10,000
Road structure	40	Straight-line	1990	250,000
Pavement	15	Straight-line	1990	150,000

The implications of the data in Table 1 are reflected in a corresponding, forecasted amortization schedule. Table 2 summarizes this schedule. As can be seen, the original cost of constructing both the road structure and pavement in 1990 was 400,000 dollars. Applying the amortization data in Table 1, this results in a book value of only 172,500 dollars by 2004 (the year prior to repaving) – a net reduction in book value of 227,500 dollars. Since the roadway is repaved in 2005, the book value (net of the year's amortization) jumps to 306,250 dollars – a net gain in book value of 133,750 dollars over the previous year. Assuming repave costs remain at 150,000 dollars per kilometre, this process continues in much the same way until, by 2030 (at which time the road structure will have been completely amortized), we expect to reach a book value of only 50,000 dollars for the pavement segment since only the residual value of the pavement surface itself will remain. Whether or not there is any 'life' left in the roadway (and, therefore, whether or not a subsequent action is carried out), the entire facility will be amortized to zero by 2035.

Table 2. Amortization schedule for paved road .

Year	Action	Book Value ($/km)	Net Change ($/km)
1990	Construction	400,000	
2004	None	172,500	(227,500)
2005	Repave	306,250	133,750
2019	None	78,750	(227,500)
2020	Repave	212,500	133,750
2030	None	50,000	(162,500)
2035	None (?)	0	(50,000)

The amortization schedule of the paved road segment is illustrated, graphically, in Figure 1. As can be seen, each component of the asset (i.e., the road structure and pavement) are amortized according to their corresponding estimated service lives, and summed to track the book value of the entire asset over time. Since the forecasted lifespan of the road structure exceeds the forecasted lifespan of the pavement by many years, it will prove necessary – according to our expectations – to replace the pavement twice during the service life of the asset (once in year 2005 and again in 2020). This is reflected in Figure 1 as sudden increases in the book value of the pavement and, therefore, the entire asset.

By 2030, the book value of the road structure will have reached zero and only the residual value of the pavement will remain. By 2035, the book value of the asset(excluding land which is not amortized) is expected to be zero whether or not the asset itself continues to provide adequate service. So while compliance with PS 3150 does provide a rational means to account for the amortization of the roadway asset and its components over time (and does reflect the influence of management decisions such as 'replace pavement'), it does not necessarily provide adequate value information for infrastructure managers seeking to 'optimally' manage the tangible assets under their purview. Nonetheless, in terms of reflecting the value of a tangible asset over time, it is certainly an improvement over simply expensing the asset in the year expenditures are incurred.

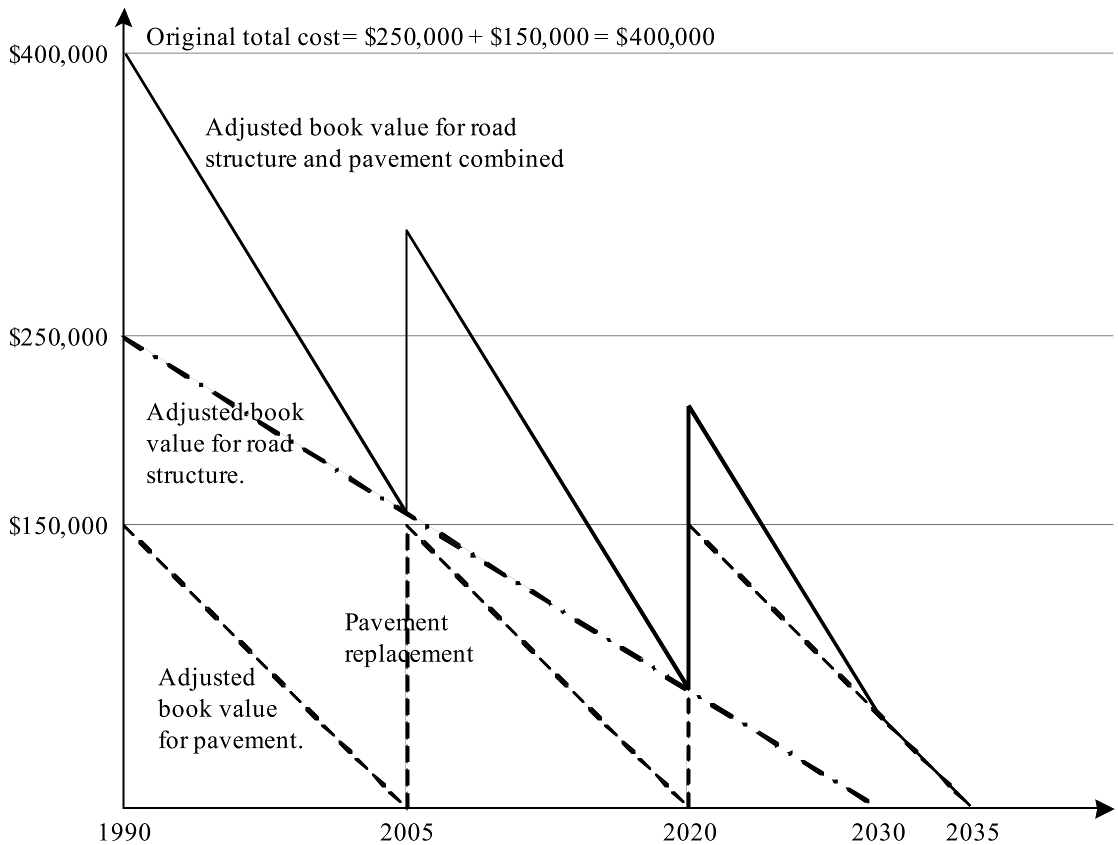

Figure 1. Adjusted book value for paved road .

Historic costs unknown: a water main segment

Consider a 1200 foot (366 metre) segment of eight-inch (200 millimetre) diameter steel water main constructed in 1985 for which historic cost data is unavailable. Assuming an estimated service life of 40 years and a straight-line method of depreciation, how might one derive an amortization schedule in compliance with PS 3150? The answer to this question involves the indexed adjustment of more current costs to estimate the costs likely incurred in 1985. (For more complete details see: OMBI Municipal Guide To Accounting For Tangible Capital Assets Version 2, January 25,2007)

The average cost (including fittings and placement) of 200 mm water pipeline in 2005 was 305 dollars per metre. The total average cost to purchase and install a 366 metre segment in 2005, therefore, would have been approximately 111,600 dollars. Assume the relevant construction cost index for 1985 and 2005 are, respectively, 346.91 and 623.03. Multiplying the ratio of these indices (approximately equal to 0.56) by the total cost in 2005 (i.e., $111,600) leads to a 1985 construction cost estimate of about 62,200 dollars. In other words, based on more current costs and relevant construction cost indices to reflect any inflationary trends over time, a reasonable estimate of the historic cost of the water main segment in 1985 is 62,200 dollars. Based on a 40-year service life estimate and a straight-line depreciation method, this translates to an amortization of approximately 1,560 dollars per year. Absent any 'betterments', therefore, the book value of the water main segment will be zero by the year 2025.

As this example shows, so long as a reasonable estimate of historic cost can be derived, it is possible to facilitate a rational implementation of PS 3150 for long-lived tangible capital assets. Again, however, the actual performance of the asset may not necessarily reflect the estimated book value. In the case of water mains, for instance, service life is notoriously difficult to estimate with any accuracy (Herz 1998). Hence, the amortization schedule could easily under- or over-estimate the true value of the water main at any given point-in-time.

Concluding remarks

Valuation can help promote rational decision-making and facilitate meaningful communication among engineering managers, accountants and the general public. Despite the fact it is based on an historic cost method, PS 3150 provides a good starting point for valuation of tangible capital assets to support their efficient management. In this regards, it is important to distinguish between the goals of financial accounting and financial management. While the former must appropriately account for expenditures already incurred, the latter – of which asset management is a subset – must employ methods of valuation that help prepare for expenditures likely incurred at some point in the future. So where a historic cost method supports the needs of accountants, financial managers of tangible capital assets may require, for instance, Fair Market Value or Written-down Replacement Cost valuation methods to help them reach good infrastructure management decisions. In any event, PS 3150 is certainly a good starting point.

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