INFRASTRUCTURE ASSET MANAGEMENT: THE VALUATION OF COMPLEX OBJECTS

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Abstract:
For two years now, Rijkswaterstaat, an agency of the Dutch Ministry of Transport, Public Works and Water Management, is required to have a financial administration, which is based on accrual accounting principles. This involves the use of a balance sheet and the equivalent of a profit and loss statement. These documents will the basis for planning and controlling of public spending. The question to be answered is: Will it be possible to calculate a 'generally accepted' value for infrastructure over its useful life by using sound accounting principles? The research is based on economic and accounting theory as applied internationally. Preliminary results indicate, that existing accounting principles are suitable for use in infrastructure management, enabling better control of public spending on infrastructure. Interviews with infrastructure providers in the Netherlands show that the transition towards an accrual-based administration will take more time than planned. Further test cases will be used for verification.

Keywords:
accountancy, asset management, infrastructure, life cycle costing, valuation

1. Introduction

Infrastructure networks, such as for land based transport systems on land, represent vast investments, made over many generations by both public and private sector organisations. Rijkswaterstaat, the Government agency responsible for road infrastructure in the Netherlands (infrastructure provider), has a programme of activities to keep road infrastructure in optimal condition pertaining to maintenance, repair, renovation and new construction. As an agency Rijkswaterstaat is subject to special rules to increase accountability (Hoek 2005). The Supreme Audit Institution stated that the introduction of a financial system based on accrual accounting (Algemene Rekenkamer, 2000: 13) is expected to lead to:

1. Improve the effectiveness of allocated budgets by
    a. Providing insight in the life cycle costs of policy decisions,
    b. Allowing a more efficient making process for investments.
2. Improve the budget allocation process.

In line with these expectations, the Government emphasises the need to employ the best management skills, processes and practises available, in order to ensure that infrastructure related services are delivered economically and timely. Part of this recommendation is an exploration of the application of asset management methods and techniques in the Dutch situation. Valuation of assets at market value is one aspect of asset management being explored by this research paper.

> *Will it be possible to calculate a 'generally accepted' value for infrastructure over its useful life by using sound accounting principles?*

The research is aimed at the following:

a) To highlight the relevance of road asset valuation with respect to the needs of users and providers, like Rijkswaterstaat;
b) To identify benefits of valuation as an asset management tool;
c) To make suggestions for valuation techniques for road infrastructure.

The research is based on literature research. Verification of the results are based on interviews with key personnel at infrastructure providers and government agencies. In this paper, concepts like asset management, valuation and depreciation will be highlighted.

2. Asset management and valuation

2.1. Asset management – scope and definition

In Australia and New Zealand public sector reform in the area of financial accounting resulted in requirements for enhanced financial reporting. This led to new rules for valuation and depreciation of assets. These initiatives led to widespread interest in asset management and planning and can be an example for agencies in the Netherlands, although the situation in the Netherlands is quite different from Anglo-Saxon context (Ingenium / NAMS Group, 2006).

In the USA the Federal Highway Administration (FHWA) has established an Asset Management Office. In Australia and New Zealand forces are combined produce guidance for professionals in the NZ National Asset Management Steering Group (NAMS) and the Institute of Public Works Engineering Australia (IPWEA).

The World Road Association (PIARC) has adopted an OECD definition of asset management, which in turn was derived from a FHWA definition, viz:

> *"A systematic process of effectively maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing the tools to facilitate a more organised and flexible approach to making decisions necessary to achieve the public's expectations."*

These broad definition boils down to the following: road asset management means managing a road network (roads, bridges, traffic facilities, etc) to satisfy the requirements of business and private road users, at the lowest possible cost over a long period of time.

The main phases in asset management are:

- Identification of need for the asset, in the light of community requirements;
- Provision of the asset, including its ongoing maintenance to suit continuing needs;
- Operation of the asset;
- Disposal of the asset when the need no longer exists or it is no longer appropriate for the asset to be retained.

Asset management includes elements focused on facilitating the delivery of community benefits such as accessibility, mobility, economic development and social justice.
Rijkswaterstaat has started the PIM project (Partner Programme Infrastructure Management) in cooperation with the UK Highways Agency and the Flemish Infrastructure Agency to look for best practices and to implement these (PIM - Partnerprogramma Infrastructuur Management, 2006).

Infrastructure providers in the Netherlands are implementing new administrative systems to improve their transparency and accountability. Valuation of the assets under their jurisdiction is one of the requirements. Asset valuation is a key element of asset management. Carrying out asset valuation requires the following (Falls en Haas, 2000):

a) A management framework;
b) Adoption of an accounting basis and methodology for actually valuing assets;
c) Performance indicators and depreciation functions or performance models for calculating future asset values;
d) Information systems for reporting network condition and asset value.

Rijkswaterstaat is aiming for better asset management, in which systematic maintenance and valuation plays an important role to provide appropriate management information in order to optimise total life cycle costs of the Dutch road network.

2.2. Valuation

Austroads, the association of Australian and New Zealand road transport and traffic authorities produced a great number of documents to facilitate the development and provision of Australasian transport. Research has shown that valuation plays an important role in enabling reporting of the physical condition of the road network in monetary terms. In addition, valuations help asset managers to inform owners about the effects of current levels of financing and management strategies.

Part of the framework for asset management is shown in figure 1. The asset management process relates information about road use, investments, standards and physical treatments, to public's expectations (needs). In the end, the assets are a means to deliver value to the community, and especially to road users.

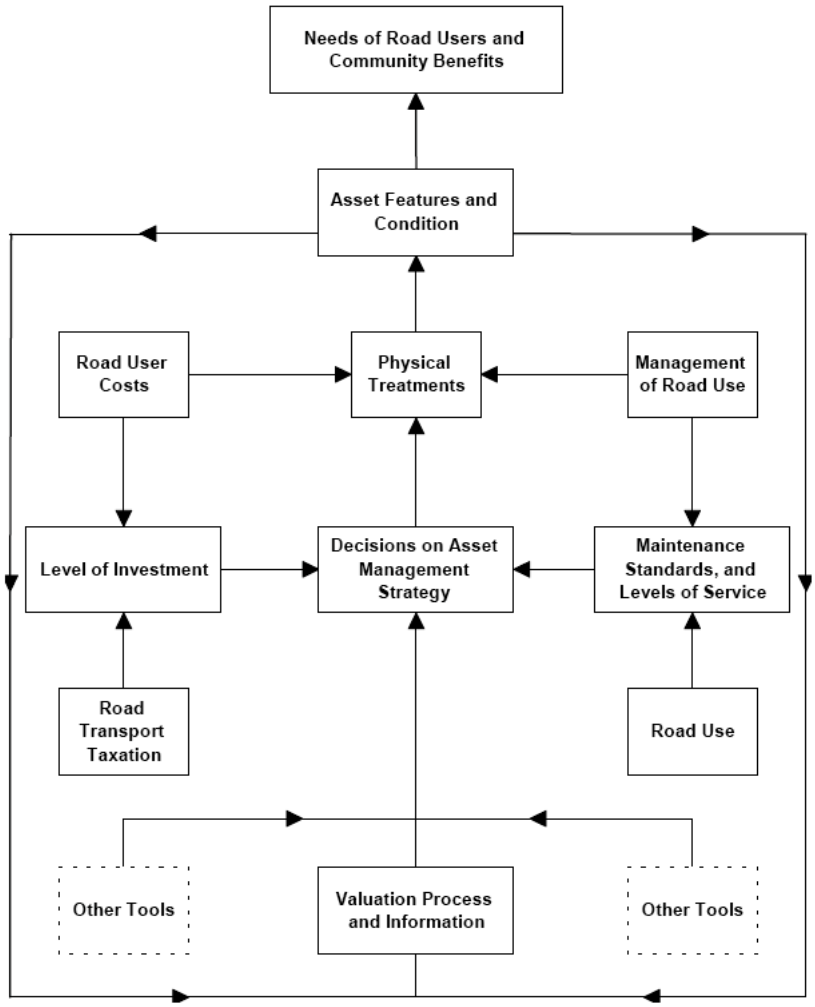

Fig. 1 The role of valuation in asset management
(Austroads, 2000: 2)

The valuation process is shown and identified as an asset management tool. The maintenance strategy and budget options can vary from eliminating all performance defects to doing nothing at all. Based on asset condition and asset inventory, valuation can take place by using 'costs to restore' or 'current replacement costs', as is indicated by international standards, laws and agreements (Austroads, 2000: 8). Most organizations use standards, which find their basis in the International Financial Reporting Standards. The IASB (International Accounting Standards Board) - based in London – is committed to develop global accounting standards that provide transparent and comparable information in general purpose financial statements (IASB, 2003: 1). The Governmental Accounting Standards Board (GASB) is currently the source of generally accepted accounting principles (GAAP) used by State and Local governments in the United States of America.

2.3. Several approaches to valuation

Local legislative requirements (laws, acts) determine the valuation and depreciation of public entities. E.g. in New Zealand, the Local Government Act 2002 (NAMS Group, 2006: 2.2) states:

"A local authority must manage its revenues, expenses, assets, liabilities, investments and general financial dealings prudently and in a manner that promotes the current and future interests of the community"

Valuation and depreciation of assets must be undertaken in accordance with the relevant financial reporting standards, primarily the International Accounting Standard 16 – Property, Plant and Equipment (IASB, 2003). The objective of IAS 16 is to prescribe accounting treatment for property, plant and equipment so that users of financial statements can discern investment information. The principal issues are the recognition of assets, determination of their carrying amounts, deterioration charges and impairment losses to be recognised.

Valuations of any type require the valuator to apply one or more valuation approaches (NAMS Group, 2006: 2.3). The valuation approaches for determining a market value (the estimated amount for which a property should change hands) include:

a) Sales Comparison Approach;
this approach considers the sales of similar or substitute properties and related data, and establishes a value estimate by the process of comparison.
b) Income Approach;
this approach considers income and expense data relating to the property being valued and estimates value through the process of capitalisation or discounting of cash flow.
c) Cost Approach.
This comparative approach considers the possibility that, as a substitute for the purchase of a given property, one could construct another property that is either a replica of the original or one that could provide equal utility.

It is noted that the cost approach to valuation is typically appropriate for infrastructure assets. The cost approach is based on the cost of reproducing the asset as an estimate of its fair value. The rationale for this is that if the asset:

- can be reproduced;
- provides the utility or service expected of it;
- is in its highest and best use;

then, potential buyers will pay a cost-related price, which is equivalent to the cost of reproducing the asset themselves.

2.4. Depreciation methods

In practice, the cost approach to valuation also involves an estimate of depreciation. Depreciated replacement cost is an application of the cost approach used in assessing the value of specialised assets for financial reporting purposes, where direct market evidence is limited or unavailable. Infrastructure is classified as a non-current tangible asset, because infrastructure will be used during more than one period (e.g. one year). The majority of infrastructure assets covered by the guidelines (IAS 16) will be of a specialised nature and will therefore be valued using a depreciated replacement cost approach. Infrastructure consists of several components with different service lives. These components are crucial to the accounting for and the depreciation of the asset and its valuation. Expert judgement will be required to decide how different components of complex items of infrastructure are

accounted for.

In accounting terms, depreciation is the proportion of an asset consumed during an accounting period (e.g. one year). Infrastructure is seen as a non-current asset, which has a useful life extending more than one accounting period. Accumulated depreciation is the part of the original cost of a non-current asset, which has been treated as an expense in successive profit and loss accounts. Accumulated depreciation, therefore, is a measure of the loss of service potential of an asset since the asset was acquired or constructed.

The purpose of depreciation is to know the net cost of a fixed asset over time. The basis for depreciation differs from place to place. Even within one country, like Australia, there are differences. Some objects are depreciated on condition and some will use the age of the construction (the service life). The depreciation curve is in some cases (traffic signals) a straight line or parabolic (bridges) over the economic life of the construction as can be seen in Table 1.

Table 1: Depreciation methods in use (selection)
(Austroads, 2000: 18)

Roads	Bridges	Traffic signals	Street lighting
Condition based, using 4 categories of roads. Pavement management System is used to calculate accumulated depreciation as the estimate of cost of restoring pavement to "near new" condition in one year.	Parabolic (age squared). Steel, concrete 70 years Timber bridge 25 years T-Beam 50 years Historic 250 years Major 100 years	Straight line, different lives are assigned to different components from 11 to 40 years	Straight line. 50 years

Australian Accounting Standard AAS 4 (AASB 1021) 'Depreciation' specifies that entities:

- Should depreciate assets on a systematic basis over their useful life;
- Apply a depreciation method which reflects the pattern of the asset's future economic benefits;
- Estimate the useful life of a depreciable asset by assessing physical wear and tear, obsolescence, and legal or other limits for the asset's use
- Review depreciation rates and methods at least annually.

Until recently, infrastructure objects were not depreciated in the Netherlands. The maintenance strategy was solely based on inspections. It can be argued that a properly maintained road has a virtually unlimited life. In the United States, financial reporting guidelines issued by the Governmental Accounting Standards Board (GASB) recognise that some infrastructure assets, such as roads, have a very long live expectancy (as the Via Appia in Italy shows). Asset depreciation should be applied only to those parts of the infrastructure, which are subject to wear.

Accumulated depreciation in the context of an asset such as a road network is an indicator of

the future cost of restoring the network from its present condition to an as-new condition. In order for accumulated depreciation to be a reliable management tool, a robust depreciation model is essential. Some assets (road pavements) can be restored to an as-new condition through physical treatments. But restoration is not economical for all assets. For instance, pavement generally exhibits a non-linear deterioration pattern, due to traffic loading, pavement age, and variations in quality of construction components. Engineering information will be necessary to determine the deterioration pattern.

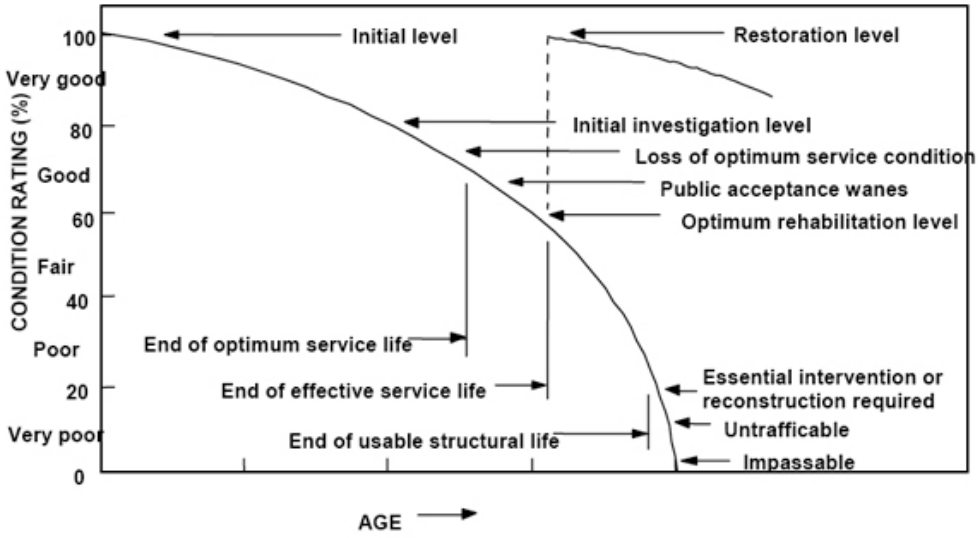

Fig. 2 Pavement deterioration curve
Source: (Austroads, 2006)

Some assets lose service potential through technical obsolescence, rather than through a deteriorating condition. Especially electronic control equipment is subject to losing service potential through technical obsolescence. In those cases condition based depreciation is not appropriate. Instead age based depreciation could give the solution, as can be seen in Table 1.

3. Possibilities of valuation in the Netherlands

The impressive international literature on infrastructure accounting topics indicates that the accounting standards will be applicable in the Netherlands. IAS 16 is available for financial reporting of accounting infrastructure. The valuation of infrastructure assets can be based on the calculation of DRC – Depreciated Replacement Cost, while depreciation calculations can be based on several methods as long as they meet international standards. In the Netherlands, pilots in the PIM project will indicate what is suitable for Dutch circumstances.

Research has been carried out through interviews of key personnel of infrastructure organisations, such as traffic managers, financial staff members and strategic officers of the Ministry of Ministry of Transport, Public Works and Water Management. The Tasmanian Audit Office reports that a significant range of practices and policies being applied to the financial reporting of road assets (Jeff Roorda and Associates, 1998). Indications are that the same goes for the Netherlands, obviating the need for standards.

In the Netherlands there is no general agreement for assigning lifespan to infrastructure in

valuation matters. International literature indicates that a ‘standard’ economic life for each category is not recommended since economic life for each road is the product of past and future maintenance, strategy, climate and topography, construction standards and traffic. The recommended strategy is that infra providers analyse the economic lives of their assets and corresponding depreciation charges and be able to explain differences and changes over time and show how their economic life is derived. The variation in economic life should continue to be reviewed because road assets are a major financial responsibility for infra providers like Rijkswaterstaat.

The Netherlands has a road asset base, which reflects the large building programme of the past decades. In comprise many sophisticated installations like traffic information systems and tunnel installations. Future funding requirements for retention of these assets might increase markedly in the next ten years. Regions where a large proportion of road networks approaches the end of their useful lives should use a valuation and depreciation methodology that estimates the remaining life of the asset, taking into account local variations such as climate, traffic, condition and maintenance levels.

Some complicating factors should taken care of by the infra provider.
Such as:

1. The capitalisation and financial reporting of infrastructure assets is a new concept. Concerning an administration based on accrual accounting, RWS is still in a transition phase;
2. Rijkswaterstaat does not have the resources and expertise yet to carry out asset management activities, necessary to provide accurate asset inventories and valuations. Asset information is therefore either minimal or fragmented and still difficult to access;
3. Asset management and public reporting of consumption of the service potential of an asset often have a low priority. The only information available is that which is perceived to be necessary for minimum statutory compliance.

4. Discussion and conclusions

The question to be answered is: Will it be possible to calculate a ‘generally accepted’ value for infrastructure over its useful life by using sound accounting principles?

As a result of researching literature and interviewing experts the following conclusions may be drawn about applying asset management, including valuation, in the Netherlands:

- There is substantial experience with asset management and valuation in some countries, especially Australia and New Zealand that can be used as reference for the Dutch situation;
- An administration which is based on the principles of full accrual accounting, is a requirement for successful implementation of asset management in the infrastructure business;
- The International Financial Reporting Standards offer sufficient opportunities for implementation of standards for valuation and depreciation of infrastructure in order to realise effective financial statements;
- In the Netherlands, several pilot projects are investigating the implementation of

infrastructure management, but none of them have realised full accrual accounting;
- Experts state that Dutch agencies are still in transition to make use of valuation techniques on a regular basis;
- International expertise can be useful for applying valuation techniques for Dutch road infrastructure.

The projects in the Netherlands indicate that the transition of cash based administration towards an accrual accounting based administration will take more time than planned. It would be worthwhile for infrastructure providers to increase their expertise in the field of accounting standards and business administration.

AMI – Asset Management Initiative – is a programme in which the following parties participate: the Delft University of Technology, the Erasmus University, infra providers (Rijkswaterstaat, ProRail) and 25 contractors. Participation of these organisations in the AMI-programme will be of utmost importance for implementing methods and techniques, strategies en reporting standards in government agencies.

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