Valuation of water resources and water infrastructure assets

Peter Comisari[1]

Lilina Feng[2]

Brendan Freeman[3]

[1]Peter.comisari@abs.gov.au
[2]Lilina.feng@abs.gov.au
[3] Brendan.freeman@abs.gov.au

VALUATION OF WATER RESOURCES AND WATER INFRASTRUCTURE ASSETS

Peter Comisari
Lilina Feng
Brendan Freeman

Executive Summary

1. The SNA and SEEA both include water resources within the asset boundary of the (monetary) balance sheet. The ABS, therefore, has undertaken a smallstudy of selected water suppliers to see if a value for water resources owned by major water suppliers could be produced using a methodology based on the NPV of expected resource rents. As expected, this approach largely gave zero or negative values for these water resources (except for hydropower suppliers, where a positive value was observed for the units selected). However, the exercise did highlight the importance of how we value water infrastructure assets - which has been an ongoing issue internationally. It is also an issue where the London Group can provide leadership.

2. Generally, there is no market-based evidence of fair value for water infrastructure assets - because of the specialised nature of these assets and the fact that they are rarely sold, except as part of a continuing business. Therefore, most water businesses estimate fair value based on the NPV of expected incomes or on depreciated replacement cost (current replacement cost, net of accumulated depreciation).

3. These two approaches yield significantly different results - or at least they do in Australia, where the water supply business is highly regulated. Australian water prices are deliberately and strictly determined by regulatory authorities, whose goal is to keep water prices as low as possible, while still allowing the water supplier to operate as a (government owned) business entity. In practice, water suppliers are permitted to earn enough to cover operating costs, a measure of depreciation, and a modest return on these assets, so that these businesses usually earn little or no operating surplus.

4. We suggest that when the business operation is effectively not-for-profit,it is inappropriate to value water supply infrastructure assets on the basis of future expected earnings. Water supply earnings will generally not meet the substantial cost of putting these assets in place. However, governments continue to operate and build water infrastructure assetsbecause of the significant benefits associated with providing a reliable, clean and safe water supply for households and businesses. A valuation based on depreciated replacement cost gives a better idea of the future expected benefits arising from holding these assets (benefits largely related to a well-functioning water supply, rather than to expected earnings of the business). It also provides a better idea of the exposure of the government/community to catastrophic loss of these assets.

Finally, it provides a more meaningful notion of return on the community's investment in these assets.

Introduction

5. Both the *System of National Accounts 2008* (2008 SNA) and the system of *Integrated Environmental and Economic Accounting 2003* (SEEA-2003)recommend monetary valuation of water resource stocks, while providing limited practical insight into how this could be achieved. SEEA–Water Resources does not address the issue of monetary valuation of water resource stocks. A number of practical issues and conceptual questions need to be assessed if such estimates are to be generated in a meaningful way.

6. This paper is made up of two parts. The first part provides a report of a small studyinto the area of valuation of water resource stocks. Itdescribes the derivation of monetary values based on expected resource rents for certain large bodies of water resources in Australia in 2009-10and also discusses sources, methods and issuesrelated to the compilation ofthese estimates.A critical decision in valuing water resource stocks is to determine the most appropriate valuation approach for the water infrastructure assets used in capturing, storing and distributing water. The second part of this paper provides a discussion of issues related to the most appropriate way to value these assets.

7. The valuation basis used for water infrastructure assets varies, often markedly, between Australian water supply businesses and this underlies the importance of the choice of valuation basis.The relevant international statistical standards do not provide definitive guidance on this question. While this issue is important to our exercise of valuing water resource stocks, it is also an important question in its own right.

8. The Australian Bureau of Statistics is committed to publishing annual Water Accounts and it is proposed that the value of Australia's water infrastructure assets be included in the ABS Water Account.This paper,therefore,discusses reasons forwanting to separately identify and value water infrastructure assets, recognising that the purpose or motivation for valuing an asset will provide key guidance to the preferred basis for its valuation.Water exhibits unique properties and the water business in Australia similarly has unique characteristics. This paper provides a description of these features, since they have potential implications for the way we choose to value both water infrastructure assets and water resource stocks.

9. A range of possible valuation bases for water infrastructure assets are then described and a valuation basis is recommended that reflects the characteristics of water, the general nature of water trading and the specific features of the water supply business in Australia. In choosing a valuation basis, it is important to recognise what information can, in practice, be extracted from the accounts of water suppliers as this sets practical limits on our preferred valuation basis for these assets.

Why value water resources?

10. Many countries commit to producing physical measures of water flows and water stocks, since these measures clearly have the potential to inform critically important policy questions. A

number of countries also generate official monetary estimates of various water flows and, again, the motivation for doing this is entirely clear. However, it is perhaps less obvious why policymakers might want to determine the monetary value of stocks of water resources.

11. It is important to establish clear reasons for the monetary valuation of water resource stocks. These reasons should reflect a desire for evidence-based decision-making and the reasons for undertaking the valuation will most likely influence the choice of estimation methodology.

12. Economic valuation of water resource stocks can, therefore:

- Support estimation of the contribution of water resources to the overall wealth of the nation. Water resources are economic assets according to the System of National Accounts (SNA);
- Derive a solid real economic rate of return on the water infrastructure assets for public budget planning and project management purposes;
- Provide a basis for developing ongoing measures of efficiency of water use i.e. to determine whether, over time, these assets are being used productively;
- Indicate whether water pricing policies currently support a positive economic value for stocks of water resources; and
- Provide a basis for the evaluation of trade-offs necessary in allocating water between competing uses.

Statistical standards and the valuation of water resources

13. The 2008 SNA is the international statistical standard underpinning much of Australia's official economic statistics; in particular the Australian System of National Accounts. This standard provides the basis for Australia's official measures of wealth as recorded in the national balance sheet.

14. SEEA 2003 is currently a satellite system of the SNA and, as such, generally utilises the principles and methods used in the SNA—though a satellite system may choose to focus on aspects that are not exhaustively dealt within the 'core' of the SNA.

15. Both the 2008 SNA and SEEA 2003 include water resources as a category of economic asset. Both recommend that a monetary value of water resource stocks be included in the national balance sheet.

16. The 2008 SNA states that water resources consist of:

> "Surface and groundwater resources used for extraction to the extent that their scarcity leads to the enforcement of ownership or use rights, market valuation and some measure of economic control." (paragraph 10.184)

17. SEEA 2003 provides some general guidance on the valuation of water resources (see paragraphs 7.300 – 7.307) but no specific guidance on the valuation of water resources as an economic asset. SEEA 2003 acknowledges the practical difficulties in valuing water resource stocks and provides a default position, which is to include the value of these resources (indistinguishably) as a component of the broader SEEA asset category of 'Land'. The water-specific module of the SEEA (System of Environmental-Economic Accounting for Water, or SEEA-Water) contains

standard asset accounts related to water (page 162), but in physical terms only. In Chapter 8, it discusses valuation of water resources,without specifically addressing valuation of water resource stocks.

18. In short, both the SNA and SEEA recommend inclusion of monetary values of water resource assets in the national balance sheet, but provide little or no specific guidance as to how this should be done.The preferred approach to valuation of assets in the SNA and SEEA is market value, that is, the value that would be achieved if the asset were sold in the open market in an arm's length transaction. Large bodies of water are rarely sold in this way and alternative valuation methods must generally be used. The 2008 SNA (paragraph 13.19) suggests other approaches when observable market prices are unavailable and the approach used in this study utilises one such suggestion i.e. that an asset may be valued according to the discounted value of future economic benefits expected from owning and using a given asset.

19. The authors acknowledge that a range of other approaches to determine the economic value of a water resource are available (both in theory and practice), a notable example being the opportunity cost technique. However, investigations into such approaches are beyond the scope of this paper.

Valuation of water resource stocks according to the 2008 SNA

20. For the purpose of this study, the value of the water resource stock is based on its implicit expected contribution to the income of water suppliers. While it is in accordance with the principles set out in the 2008 SNA,this is a narrow view of the economic value of water. A slightly broader view might consider, for example, the impact of water on agricultural income. Under such a view, the value of irrigated water might be seen as equivalent to the additional agricultural income subsequently arising from the use of this water.

21. The valuation of water resources is beset with conceptual and methodological difficulties. Furthermore, non-consumptive use values, indirect values and, especially, non-use values present enormous challenges. Accordingly, the estimates generated in this study follow the asset boundary of the 2008 SNA and associated valuation principles and, therefore, relate to a strictly and narrowly defined range of consumptive use values.

22. The majority of the literature devoted to valuation of water is focussed on valuation of various water flows. The valuation of a body of water presents some unique difficulties. A body of water, such as might be held behind a dam wall, may be used only partially during an accounting period—or it might be used many times over. It is possible, or may even be expected, that the body of water will disappear completely for periods of time; that is, the body of water may be expected to have a finite asset life. In countries with unpredictable rainfall, this asset life may be entirely unpredictable.

What is unique about the Australian water supply industry?

23. Water and the Australian water supply business have a number of special characteristics. Water is an extremely heavy product, which, combined with its very low price, means that it can only

be traded readily where gravity supports its bulk movement. Accordingly, water is rarely sold outside the catchment area into which it falls.

24. Since water is truly an essential product, governments often take a special interest in the security of water supply and in water pricing. For a major urban area to run out of water would be a human and political catastrophe and governments go to considerable lengths to avoid this outcome. By international standards, the per capita volume of water stored by Australia's urban water suppliers is very large. This reflects not only the highly variable rainfall experienced over much of Australia, but also a commitment by Australian governments to maintain an assured supply of water to its major urban centres. Nevertheless, water prices are very low in Australia and, therefore, any necessary reductions in water consumption in major urban areas have been achieved largely through voluntary or mandatedwater restrictions.

25. While water is often supplied by corporations in Australia, water prices are tightly controlled by the various state and territory governments and are certainly kept lower than would be the case if these corporations operated in an unrestricted market. For example, water prices in the state of New South Wales (NSW) are regulated by the Independent Pricing and Regulatory Tribunal (IPART); in Victoria by the Essential Services Commission (ESC); and in Western Australia (WA) by the Economic Regulatory Authority (ERA). Within the Commonwealth sphere the Australian Competition and Consumer Commission (ACCC) contributes to the broader issue of water pricing policy.

26. The following example illustrates the degree of control. The ESC finalised a water price review in mid-2009 to determine water prices and service standards for the following four years. The preface to the final decision states that:

> "In reaching its final decision, the Commission's main focus has been to ensure that prices are fair and reasonable, that is, *as low as possible but still sufficient to recover the businesses' efficient costs of providing services*." (Emphasis added.)

27. A 2011 report by the Productivity Commission into Australia's urban water sector found that while increasing levels of financial hardship reported by community organisations are the result of broader-based price increases (food, housing, petrol, other utility services) they are *not* generally related to price changes in the urban water sector.

28. A brief examination of the revenue required to meet current and capital costs of the water suppliers illustrates the basis of the pricing determination and the critical role that valuation of water infrastructure assets plays in this determination. Table 1 details the revenue requirements implied by the ESC's final decision.

Table 1 ESC 2009 water pricing final decision: revenue requirement ($ million, Jan 2009 prices)

	Operating expenditure	Return on existing assets[4]	Return on new assets	Regulatory depreciation	Taxes	Total
City West Water	1 124.5	186.0	72.3	108.4	28.8	1 519.9
South East Water	1685.6	363.0	78.7	173.4	41.9	2 342.8
YarraValley Water	1 706.6	420.6	141.5	193.5	0.0	2 462.2
Melbourne Water	1 416.8	849.9	434.7	416.4	83.7	3 201.6
All businesses	**5 933.6**	**1 819.5**	**727.3**	**891.7**	**154.4**	**9 526.4**

Source: Essential Services Commission, Final Decision: Metropolitan Melbourne Water Price Review 2009, page 29, Table 3.2

29. The table provides a 'total' which represents the amount that must be recouped through water sales if the operator is to effectively break-even. Victorian water prices are set by the regulator (ESC) at a level expected to achieve this break-even outcome. That is, the water supplier will only be allowed to charge a price that covers its expected operating expenditures; its expected taxes; its expected depreciation; and allows the operator to realise a return on the produced capital it owns. In this review, the return on capital is set only to meet financing costs of the business. There is, effectively, no return related to the risk of holding these assets. The weighted average cost of capital assumed in 2009 is only 5.1 per cent; considerably below the return typically expected on a capital asset used in an unrestricted market. The regulatory experience in Victoria is mirrored across the rest of Australia.

30. In short, the water supply business in Australiais tightly controlled. And there is sound reasoning for this control, notably to prevent price gouging by water suppliers who tend to occupy a monopoly position in their catchment/market; and for reasons of social equity. Regarding the latter, the2011urban water sector report by the Productivity Commission found that a key objective of current water pricing policy to be: *'social welfare and equity considerations, including community service obligations, the availability of goods and services to consumers and the social impact of pricing practices'* (emphasis added).

31. In relation to water supply, Australian government concerns mainly relate to: reliable and safe supply of water to urban centres and the significant cost of building and maintaining water supply infrastructure assets. In contrast, any government earnings from water sales are generally an insignificant component of total government revenue.

32. Water reservoirs can serve multiple purposes and,in some cases, conflicting purposes. For example, Brisbane's Wivenhoe Dam performs dual roles of flood mitigation and urban water

[4]These assets follow the Regulatory Asset Base valuation. It excludes, for example, those assets gifted by government and those funded by customers' contributions.

supply. Such dual roles tend to further compromise the water supplier's ability to act as a free market operator in the water supply business.

33. In Australia, water supply assets are rarely, if ever, sold. Water supply businesses are also rarely sold as they are unlikely to be attractive to potential buyers under present regulatory conditions. The water supply business in Australia is, therefore, quite different to most businesses in Australia and this has potential implications in attempting a monetary valuation of water resource stocks.

34. The implications for the present study are clear: urban water pricing policyin Australia ensures that prices charged by urban water suppliers barely cover the sum of: operating expenses, tax obligations, and a modest return on produced capital. Therefore,they could be expected to struggle to support any notion of resource rent on the water resource i.e. the water resource itself will have no apparent value and therefore its owner need receive no financial return for putting this resource to use in a process of production. The point of this study is to test this hypothesis by examining publicly available data for selected Australian water suppliers. More generally, the study also aims to draw out methodological and other issues associated with measuring the value of water resource stocks.

The value of water stocks for selected entities

Summary of the study

35. A total of 13 water suppliers were profiled. These were comprised of five urban water companies from across Australia and eight regional councils in NSW. The comprehensive and uniform reporting requirements laid down by the NSW government for water suppliers underpinned our decision to extensively profile regional councils from that state. In addition to the water providers, two hydroelectric power suppliers were also profiled for comparison purposes.

Methodology used

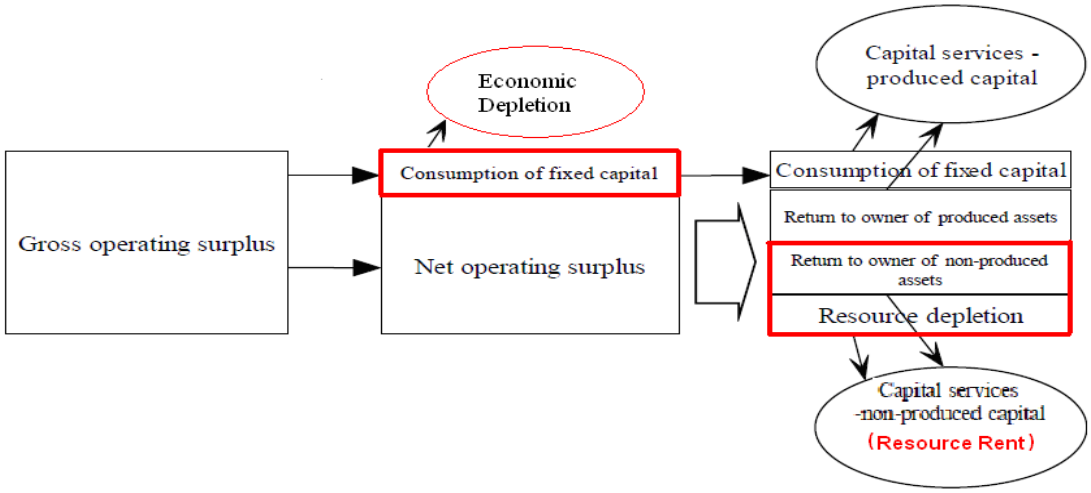
36. Data from the water utility businesses were taken from their respective 2009-10 annual financial statements. These data were then placed into a methodological framework designed to estimate the value of the water resource stock of each business.

37. Gross Operating Surplus (GOS) is the starting point from which to calculate resource rent, as illustrated by Diagram 1 below. GOS is similar to the commercial accounting concept of profit except that it excludes transfers such as dividend payments and receipts, and includes depreciation expense. GOS is also recorded before payment of income tax, however, interest receipts and payments require special attention.

38. In the national accounts, interest receipts and payments are not treated as output and intermediate expense (respectively). Instead, it is the imputed financial service charge that must be deducted from the output of the water supplier in deriving GOS. The 2008 SNA (paragraphs 6.163-6.169) describes the concept and derivation of the Financial Intermediation Service charge Indirectly Measured (FISIM). It is the FISIM that is deducted from output in the derivation of GOS (financial institutions that undertake financial intermediation can also generate FISIM output, but this doesn't apply to water suppliers). The Australian System of National Accounts derives a full matrix of FISIM i.e. showing the generation of this service charge and who consumes it, including by industry and by sector. However, it does not record FISIM for individual businesses or for water suppliers as a group. For the purpose of our case study analysis, an approximation of FISIM was calculated for each of the selected businesses.

39. Diagram 1 illustrates that by adjusting GOS for consumption of fixed capital Net Operating Surplus (NOS) is calculated. In SEEA, NOS is interpreted as the return to capital.

Diagram 1: Decomposition of the operating surplus for an entity using natural resources



40. Produced capital relates to assets owned by the firms that contribute, either directly or indirectly, towards the supply of water. Since a firm has invested in assets, it would expect a financial return on all related assets currently in operation. In the case of a water utility, this definition extends beyond dams and pipes etc. to include buildings, office equipment, software, and so on. Work-in-progress and non-revenue producing completed infrastructure are, however, excluded because assets matching this definition are not operational and, therefore, no return can justifiably be expected from them in the current accounting period. Nevertheless, work on major dams can be very expensive and may take place over an extended period of time.

41. An appropriate 'rate of return' on relevant infrastructure assets must be determined. Generally speaking, a higher risk operation will expect a higher return on investment. The operation of utilities for urban household consumers is typically one of the lower risk, lower return operations, in which case it would be appropriate to assign a rate a little above the interbank lending rate (around 5 per cent for the period in question). However, the risk – return assumptions for water supply business could change. There appears to be a growing expectation that water users should pay prices that influence the use of an increasingly scarce resource. Any shift of water business to the private sector would likely reinforce this expectation, since private sector operators could be expected to be less receptive to artificially low prices for the product.

42. The NOS measure will contain an element described in the study as 'resource rent', which could be thought of as the 'return' to the owner of the natural resource. Resource rent is calculated as the residual part of NOSafter a return on produced capital for the current year's operations has been deducted. It is recognised that NOS may not capture all resource rent as some of the benefits from the supply of water do not accrue to the owners of the resource, but to the users. This is partially recognised in the provision of government grants to water suppliers in recognition of community service obligations. These grants are included in the revenues of

water suppliers and hence have a positive contribution to NOS. However, these grants may not fully represent the benefits to households accrued from the provision of low cost water.

43. The value of the water stock is determined as being the expected resource rents arising from the supply of water over the expected life of the water asset. It should be noted that the rents are dependent on both the physical extraction of water from water storages and the revenue earned from the supply of this water. The NPV method used to determine the present value of net cash flows is represented in equation 1. In the absence of information or insight on how the business of a water supplier will change going into the future, we have assumed for the purposes of this paper that the observations of resource rents and business operations for 2009-10will continue into the future. Ideally an average of these would be used to help smooth the year-to-year variation in these measures.

Equation: 1

$$\text{WATER RESOURCE STOCK VALUE} = NPV_{CF} = \sum_{n}^{1} \frac{\text{Resources Rent}_t}{(1+r)^t}$$

Where: r = discount rate, n = asset life

44. The asset life for water resources is not straightforward in either concept or practice. Since major urban water supplies have rarely, if ever, run dry in the modern history of Australia, we suggest assuming an indefinite life for the asset. In any case, using a discount rate of 6 per cent means that the benefits accruing beyond the 25 years into the future are almostnegligible. The discount rate used here was based on an interbank lending rate of 5 per cent plus a small risk premium (1 per cent). Of the water suppliers that did provide details of applied discount rates, the levels varied considerably.

Issues

45. Determining accurate and appropriate values for each utility's produced capital is essential to the robustness of the assessment. Water supply revenue-related produced capitalis a key component of the methodological process and variations in its value can significantly influence water resource valuations. A decision on appropriate valuation for these assets, however, is not always straightforward.

46. The choice of valuation basis can result in significantly different valuation figures for the same asset. The nature of the water supply business means that market-based evidence of fair value is unlikely to exist. In addition, water infrastructure assets can legitimately be described as specialised in character, meaning that the Australian accounting standards allow fair value to be generated using either income or discounted replacement cost approaches. This is discussed in some detail below.

47. Isolating the appropriate produced capital values for water utilities with multiple business lines can be troublesome. Some firms, while separately identifying their water infrastructure assets, put the entire amount of their non-current assets such as property plant and equipment into a single group, without separately identifying various business lines. To address this situation, combined groupings ofassets are split into various business lines on the basis of the firm's revenue from these various business lines.

48. While work in progress (WIP) was excluded from calculations of produced capital values, due to the non-functioning nature of the asset, it should be noted that not all financial reports make a clear distinction between WIP and functioning water production assets. For some firms, further investigations were required in order to strip out all non-functioning assets.

49. Water supply revenues and expenses are used in the composition of GOS. Most firms with multiple business lines readily isolate water supply revenues from other revenue streams in their reports. This is not always the case for business expenses, with many firms grouping all expenses together. Again, the share of those expenses attributable to water supply business is approximated on the basis of the corresponding share of the firm's revenue from the water business line.

50. There is also some uncertainty over what precisely constitutes water supply revenues. For instance, income from capital works relate to future, not current, revenue generation. There are, therefore, solid arguments for the exclusion of such revenues. In the study, capital works income was included, becausein most cases the inclusion of such questionable revenue streams was offset by corresponding (and unavoidable) inclusion of such costs in business expenses.

51. The study assumed a discount rate of 6 per cent. Of the water firms that did provide some indication of applied discount rates, the levels varied considerably. A number of factors could drive this. One could be the level of a firm's debt, with the more indebted firms using a higher estimated rate of return. Likewise, the discount rate applied to a desalination plant asset might also be higher, given the more intermittent nature of its use—i.e. much higher use during drought periods.

Summary of results

52. Data wereobtained from balance sheet valuations for the water resource stocks of selected Australian water suppliers. In the absence of information or insight on how the water firms' business will change going into the future, we assume that resource rents and business operations will continue into the future on the basis of what we observed in 2009-10.

53. Average operating surpluses from the water business; the average value of water infrastructure assets from which operating surpluses was generated; and the average rate of financial return firms receive from their respective water infrastructure assets were calculated. Resource rents, if any, arising from the use of the natural resource in its current capacity were also considered. Results were grouped by urban water suppliers, rural water suppliers and hydroelectric power providers.

54. For the majority of water suppliers, no positive resource rent valuations were generated.

Results

55. There was considerable variation in the rates of return (RoR) on water infrastructure across the water suppliers profiled. Despite this, the overall trend was for a comparatively low RoR. This was particularly evident amongst rural water suppliers, where the average RoR was just 1.3 per cent. While also low, the average RoR for urban water firms was higher at 4.6 per cent.

56. The NOS of many water firms were low relative to the value of the water infrastructure assets used in the production process. This infers that water prices, particularly amongst regional councils, barely allow a return on assets and never deliver an implied value on their respective water stocks.

57. Two Hydro-electricity suppliers were included in the review as a point of comparison. In contrast to water suppliers, returns on produced capital for the hydroelectric power businesses were significantly higher. The likely explanation is that the degree of autonomy hydroelectricity power suppliers have in setting the prices they chargeis considerably higher thanfor water suppliers. This enables the hydroelectricity suppliers to earn a significantly higher return on their water infrastructure assets than is the case for urban water suppliers. Since hydroelectric power is substantially carbon-free, higher electricity prices arising from a scheme to place a price on carbon, is likely to deliver a higher resource rent value on the water used by hydroelectricity power generators.

The Valuation of Water Infrastructure Assets

How and why to value water infrastructure assets?

58. Returning to the important question of how to value water infrastructure assets, the quantum of asset value can vary dramatically depending on the valuation basis and nature of the assets involved. Therefore, we must consider our reason for measuring this asset value.

59. Possible reasons for valuing water infrastructure assets:

    To measure the net worth of the firm;that is,to informthe owners(who may be individuals, shareholders, government etc.) of their wealth held in the firm;

    To establish a possible sale price for the assets in question–as either the expected benefits from selling the assets; or as a component of the value of the entity as a going concern;

    To apprise owners of the likely replacement cost of the asset in the event of its destruction or damage;

    To generate estimates of return on asset; and

    As a basis for generating ongoing measures of productivity.

What bases could be used to value water infrastructure assets?

60. There is a wide range of bases by which these assets might be valued. Broadly speaking, these bases tend to fall into one of two broad categories of valuation: historic cost or revaluation ('fair value').

61. Fair value can be determined on the basis of market value.For many purposes and for many assets this is the preferred valuation—within both commercial accounting and economic accounting; the latter, as described in the SNA.

62. Australian Accounting Standards (AASBs) require the assets be valued to the extent as providing a relevant and faithful ground for economic decision-making.Although the AASB 116 Property, Plant and Equipment recognises both the cost model and the revaluation model in the valuation of non-current assets, the revaluation model is still preferred as it reflects the true economic worth of the asset. The ideal proxy of fair value, both in terms of SNA or AASBs, is an observed market price. However, water infrastructure assets are highly specialised; and if sold, would only be sold as part of a cash-generating business. In order to determine the most appropriate valuation basis for water infrastructure assets in Australia, this section illustrates the key concepts and discusses available valuation methodologies underpinning fair values adopted by water businesses.

A. Key economic and accounting concepts

i. Fair value
"***The amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction***." (*AASB 1 First-time adoption of the Australian Accounting Standards, para.23)*

"If there is no market-based evidence of fair value because of the specialised nature of the item of property, plant and equipment and the item is rarely sold, except as part of a continuing business, an entity may need to estimate fair value using an income or a depreciated replacement cost approach."*(AASB 116 Property, Plant and Equipment, para. 33)*

ii. Return on water assets (ROA)

$$ROA = \frac{Net\ Income\ from\ Water}{Total\ Value\ Water\ Infrastructure\ Assets}$$

Viable valuation basesinclude:

i. Current Replacement Cost (CRC)
The cost to construct or replace the exact same asset today, regardless of the depreciation incurred.For water assets with no active market, it provides an indication of the investment required to replace the asset; for example, in the event of catastrophic loss.

ii. Depreciated Replacement Cost (DRC)
The current replacement cost, net of accumulated depreciation. It is generally a more reliable measure of the remaining economic benefits of the asset compared to current replacement cost.

iii. Net Present Value[5] (Value in use, discounted cash flow, internal rate of return)
"The present value of future cash flows expected to be derived from an asset or cash-generating unit" (*AASB 136 Impairment of Assets*).

63. Market valuation is not always used, either because such valuation is not possible; or because it is considered inappropriate in the circumstances. In the absence of a clear market value, authorities in Australia have adopted alternative measurement bases for water infrastructure assets. For instance, the National Water Commission uses the DRC method for infrastructure assets operated by urban water entities.

64. In commercial accounting, either a DRC or an income approach is generally used where market values are not available or are considered inappropriate. For example, Melbourne Water values its water infrastructure assets using the income approach, while many other water suppliers have applied a valuation based on DRC.

[5] The net present value approach is synonymous with the income approach referred to later in the document

65. There is a further consideration of the 'recoverable amount' associated with an asset. AASB 136 Impairment of Assets states that the carrying amount of an asset should not exceed its recoverable amount. If the entity is for-profit, recoverable amount is the present value of expected future cash inflows. If the entity is not-for-profit, the recoverable amount is referred to as 'value in use'. For specialized assets, such as water infrastructure assets, value in use equates to DRC (AASB 136 para. Aus 32.1).

66. Investigations recently undertaken by the ABS suggest that many entities markedly write down the value of their water infrastructure assets following application of the impairment test. This is entirely reasonable given that the water suppliers are classified as 'for-profit' organisations and the expected benefits from using these assets may not match the often substantially higher cost of putting these assets in place. The expected benefits arising from holding and using these assets are, of course, profoundly affected by the highly regulated pricing of urban water.

67. Nevertheless, the often substantial reduction in asset value following application of the impairment test does not reflect the cost of putting these assets in place. It also delivers a higher measured rate of return on water infrastructure assets compared to a valuation based on actual investment or DRC. For example, the operating return on infrastructure assets in 2009 for one of the water suppliers selected for the study is approximately 7.2 per cent (close to the yield of a 10-year Commonwealth bond) when water infrastructure assets are valued on a post-impairment test basis; and 4.2 per cent (close to the prevailing Reserve Bank of Australia cash rate) when valued on the pre-impairment test basis.

68. A number of Australian water suppliers publish estimates of water infrastructure assets on multiple valuation bases. For example, the annual report of one water supplier reveals that the value of its water infrastructure assets (excluding work in progress) at 30 June 2010 was $2,473 million using a DRC valuation and $1,459 million under an income approach to asset valuation. Corresponding figures from the annual report of another business are $760 million and $533 million—and these sets of results are typical for businesses reporting water infrastructure asset values on both DRC and income bases. As observed above, the choice of reporting basis has a potentially significant impact on the reported value of these assets and the choice of valuation basis can considerably influence such things as return on assets.

Does a current replacement cost valuation provide useful information?

69. A further possible valuation basis is the Current Replacement Cost (CRC). This is the cost to construct or replace the exact same asset today, regardless of any depreciation incurred. It typically delivers the highest asset value among all the valuation methods discussed here. Technically, current replacement cost is less relevant for a business because there is no need to replace water infrastructure assets during a normal business cycle. However, it would provide an appropriate basis for an asset insurance reserve account to meet the cost of replacing water infrastructure in the event of loss or major damage. At the very least, it provides state governments with a realistic idea of the cost to quickly replace these assets in the event of a catastrophic loss.

70. The following example demonstrates the potentially wide gulf between a carrying amount based on DRC, and the cost of completely replacing the existing asset stock in the event of catastrophic loss.

Example of Comparison between Different Valuations	
State Water (NSW) at 30 June 2009	
DRC/Carrying Amount	CRC/insurance reserve
$296 394 419	$3 488 203 131

Source: National Water Commission National Performance Reports 2009-10

71. The replacement cost valuation basis provides valuable information to a very specific policy interest. However, it should be used as supplementary information only for this specific policy question and should notform the primary basis for valuation of water infrastructure assets in the ABS Water Account.

International Statistical Standardsand the valuation of fixed capital

72. The2008 SNA is the international statistical standard underpinning much of Australia's official economic statistics; in particular the Australian System of National Accounts. This standard provides the basis for Australia's official measures of produced capital as used in the national balance sheet, estimates of capital stock, and productivity measures.

73. The ABS Water Account follows the concepts and methods set out in the SEEA 2003 module related to water accounts (SEEA-Water). In general, the principles used to value fixed capital in the SNA and the Australian System of National Accountsshould therefore also provide the valuation basis for water infrastructure assets to be published in the ABS Water Account. It follows that we must consider 2008 SNA recommendations on the valuation of fixed capital assets.

74. The SNA 2008 states that:

> In addition to values observed in markets or estimated from observed prices, values may be approximated from balance sheet valuation in two other ways. ***In some cases, values may be approximated by accumulating and revaluating acquisitions less disposals of the type of asset in question over its lifetime and adjusted from changes such as consumption of fixed capital; this generally is the most practical and also the preferred method for fixed assets, but it can be applied to other assets as well.*** In other cases, values may be approximated by the present, or discounted, value of future economic benefits expected from a given asset; this is the case for a number of financial assets, natural resources and even for fixed assets.
>
> (paragraph 13.19, emphasis added)

75. The 2008 SNA is therefore recommending an asset valuation, in the absence of observed market values, equivalent to the DRC method.

76. The 2008 SNA further specifies that:

> The value of such an asset at a given point in its life is given by the current acquisition price of an equivalent new asset less the accumulated depreciation. This valuation is sometimes referred to as the "***written-down replacement cost***". … (paragraph 13.23, emphasis added).

77. The International Monetary Fund's (IMF)*Government Finance Statistics Manual 2001* (2001 GFS) forms part of the suite of international economic statistics standards and is largely consistent with the SNA. However, the 2001 GFS provides additional guidance on the valuation basis to be used for various asset types. The 2001 GFS states that the income approach may be used to value assets in certain circumstances (certain financial assets; naturally occurring assets; and intangible assets) but that in the absence of observable market prices "most fixed assets are recorded in the balance sheet at their written down replacement cost" (para 7.27). This is the original acquisition value of the asset, adjusted by an allowance for price changes and written down for accumulated depreciation and is equivalent to depreciated replacement cost. That is, for typical Australian water infrastructure assets, the GFS appears to provide clear support for valuation based on depreciated replacement cost.

78. In practice, the Australian System of National Accounts compiles estimates for water infrastructure assets using the Perpetual Inventory Method (PIM). The PIM indexes the annual construction cost of the asset, net of subsequent depreciation. The principles and techniques used in the PIM are entirely consistent with the 2008 SNA and also with the notion of DRC.

79. The SEEA and SEEA-Water provide no direct guidance on the question of valuation of water infrastructure assets. For example, SEEA-Water acknowledges that water infrastructure can be a substantial component of costs in the supply and use of water resources (para 8.41) but provides no specific guidance on how such capital should be valued. SEEA-2003 (paras 2.132 - 2.133) re-affirms the SNA preference to use market prices wherever practicable, though it acknowledges that this is not always possible and that alternative methods must then be sought. SEEA-2003 specifically mentions an alternative technique of asset valuation based on the discounted value of the future expected stream of income arising from use of the asset. However, there is no specific recommendation that this alternative asset valuation be preferred in the absence of market values. We must therefore refer to the SNA for the conclusive preferred alternative to market valuation.

Practical considerations for the ABS

80. Both Commercial Accounting Standards (AASB) and Economic Accounting Standards (SNA, SEEA)must be considered in selectinga preferred valuation basis for water infrastructure assets. Commercial accounting standards determine what is available from business accounts and the terminology used is also what respondentsto ABS surveys are familiar with. ABS statistics must support informed economic decision making and integrated environmental-economic analyses.

81. Therefore, the ABS' choice of valuation basis must reflect both what data are available from standard business accounts in the water supply industry and also the concept most useful to decision-makers in this field.

Assessment of valuation options: water infrastructure assets

82. The nature of the water supply business means that market-based evidence of fair value is unlikely to exist. In addition, water infrastructure assets can legitimately be described as specialised in character, meaning that the Australian accounting standards allow fair value to be generated using income or DRC approaches.

83. The question then arises, which of the two approaches–income or DRC–is most appropriate to valuing Australia's water infrastructure assets? The answer is determined by the type of economic benefits expected from holding and operating these assets.If the assets are expected to earn a commercial return in the form of a cash flow reflecting the risk of holding these assets, then an income approach to asset valuation may be appropriate.

84. Alternatively, the expected economic benefit of the water infrastructure assets may primarily take the form of a safe, reliable and cheap water supply for Australian businesses and households, inwhich case the (considerable) benefits expected from holding these assets will not be reflected in the income stream of the water supplier and the income approach to asset valuation is therefore not appropriate.

85. Ideally, the valuation basis would be determined on a case-by-case basis, reflecting on the nature and operation of each enterprise engaged in water supply. However, the ABS does not generally have the luxury of following or enforcing this approach. Instead, a judgement must be made about which approach is appropriate for the industry as a whole—at the same time acknowledging that some businesses may not follow the 'norm' for the broader industry.

86. The following observations and questions are made about the water supply business in Australia:

- Australian water suppliers operate under a regulatory regime which aims to ensure that water prices are kept as lowas possible while at the same time covering suppliers' current and capital costs.

- AreAustralian water infrastructure assets typically held for the primary objective of generating net cash inflows?

- Are Australian water suppliers usually classified as for-profit or not-for-profit, as per Australian Accounting Standards?

- How often are Australian water infrastructure assets retired for generating insufficient cash return?

87. Also, who are the owners of water infrastructure assets and do theyview these assets primarily as money generators? Alternativelyare they seen primarily as the means by which a cheap, safe and reliable supply of water is delivered to households and businesses in the catchment?

88. As we have seen in preceding sections of this paper, businesses in the Australian water supply industryusually generate minimal or no profit (and therefore no return on assets) even thoughthese businesses would view themselves as 'for-profit' entities. The economic benefits of water infrastructure assets donot appear to reside in their ability to generate a commercial return. Instead, much of the economic benefit appears to reside with the multitude of Australian businesses and households who receive a clean and reliable water supply at a price kept artificially low by a dedicated regulatory regime.

89. Considering all of the above, it would generally be difficult to support an income approach to the valuation of Australia's water infrastructure assets;thatis, much of the benefit expected from holding and using these assets will not be reflected in expected future income streams of water suppliers. An income approach would, therefore, understate the value of these assets and provide a higher measured return on assets. An income approach,on the other hand,would be appropriate for a prospective buyer of these assets in assessing the value of the entity as a going concern.

90. DRC approximates the (written down) cost of putting water infrastructure assets in place and, therefore, the investment in these assets. In many cases, the very large capital cost of commissioning water infrastructure assets is at least partlymet by the broader community through government contributions. Consequently, DRC provides a meaningful basis for deriving estimates of the return on this investment.

91. As noted earlier, the DRC method is entirely consistent with the preferred valuation basis of the 2008 SNAfor those assets where market values for the assets in question are not readily observable. Adoption of the DRC method as the preferred valuation basis for Australia's water infrastructure assets is, therefore,in linewith the principles underpinning Australia's official economic statistics. It is also consistent with the principles and methods set out in SEEA 2003 (the satellite system of the SNA which focuses on environmental concerns) andtherefore provides the preferred basis to value water infrastructure assets within the ABS Water Account.

92. In short, **it is recommended that water infrastructure assets be valued on the basis of DRC**. As a secondary recommendation, it wouldalso be worthwhile investigating possible inclusion of supplementary data series in the ABS Water Accountbased on the full replacement cost of water infrastructure assets. This would provide an indication of the community's exposure to the loss or damage of these essential assets.

References

Australian Accountings Standards Board (AASB):

AASB 116 Plant, Property and Equipment, 2009, AASB, viewed April 2 2011, <http://www.aasb.gov.au/admin/file/content102/c3/AASB116_07-04_ERDRjun10_07-09.pdf>

AASB 136 Impairment of Assets, 2010, AASB, viewed April 2 2011, http://www.aasb.gov.au/admin/file/content105/c9/AASB136_07-04_COMPjun09_01-10.pdf

Australian Bureau of Statistics (2000), *Australian System of National Accounts: Concepts, Sources and Methods 2000*, Cat no. 5216.0.

Australian Competition & Consumer Commission (ACCC):

Draft ACCC Pricing Principles for Price Approvals and Determinations under the Water Charge (infrastructure) Charge Rules, 2011, ACCC, viewed April 14, 2011, http://www.accc.gov.au/content/item.phtml?itemId=967978&nodeId=6b11b929a17611a7c8a865e58f616bfb&fn=Draft%20ACCC%20pricing%20principles%20for%20price%20approvals%20or%20determinations%20under%20the%20Water%20Charge%20(Infrastructure)%20Rules.pdf

Burnell, D (2007) *Non-Financial Assets: Recent Developments in the Household Balance Sheet in Australia*. Paper presented to the meeting of the OECD Working Party on National Accounts, Paris, 3-5 October 2007.

Economic Regulatory Authority (ERA):

Inquiry into Water Resource Management and Planning Charges, 2011, ERA, viewed April 17 2011, http://www.erawa.com.au/cproot/9476/2/20110329%20D62487%20Final%20Report%20%20Inquiry%20into%20Water%20Resource%20Management%20and%20Planning%20Charges.PDF

Essential Services Commission (ESC):

Final Decision: Metropolitan Melbourne Water Price Review 2009, page 29, Table 3.2, viewed April 15 2011, http://www.esc.vic.gov.au/NR/rdonlyres/743B506E-9E00-494C-B377-A18DB9114595/0/FDPMetropricereview2009finaldecision20090625.pdf

Gretton, P and Salma, U (1996) *Land Degradation and the Australian Agricultural Industry,* Industry Commission, Canberra.

Independent Pricing and Regulatory Tribunal (IPART):

Guidelines for Water Agency Pricing Submissions, 2011, IPART, viewed April 15 2011, http://www.ipart.nsw.gov.au/files/Guidelines%20for%20Water%20Agency%20Pricing%20Submissions%20%20April%202011%20%20Alex%20Kelty%20%20Website%20Document.PDF

Kemp, A, and Connell, P (2001) *Impact of land degradation on Australian agriculture: A land values approach*, Australian Bureau of Agricultural and Resource Economics, Canberra.

Kim, Young-Hwan (2008) *Estimation of the stock of land in OECD countries*. Presentation to the October 2008 meeting of the OECD Working Party on National Accounts.

National Land and Water Resources Audit (2002) *Australians and natural resource management 2002*, Canberra.

National Water Commission (NWC):

National Performance Report 2009-10 – Rural Water Service Providers, 2010, NWC, http://www.nwc.gov.au/__data/assets/pdf_file/0017/11285/NPR_rural2.pdf

National Performance Report 2009-10: Urban Water Utilities, National Water Commission website http://www.nwc.gov.au/publications/bookshop/april-2011/national-performance-report-2009-10-urban-water-utilities

Ryan, L, Johnson, T, and Singh, J (2001) *Adjusting the National Income Accounts for the Depletion of Natural Resources*, Australian Bureau of Statistics. Presented at Conference of Economists, Perth, 23-27 September, 2001.

United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, World Bank, *Integrated Environmental and Economic Accounting 2003*, Brussels/Luxembourg, New York, Paris, Washington D.C., 2003.

United Nations, European Commission, International Monetary Fund, *Organisation for Economic Co-operation and Development*, World Bank, *System of National Accounts 1993*, Brussels/Luxembourg, New York, Paris, Washington D.C., 1993.

United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, World Bank, *System of National Accounts 2008*, <http://unstats.un.org/unsd/nationalaccount/SNA2008.pdf>