

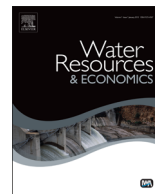


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# Experimental valuation of Dutch water resources according to SNA and SEEA



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### ABSTRACT

The valuation of water resources is an important element for sustainable water resource management. Valuation exercises depend on their purpose and context of use. The objective of this paper is to investigate methods to value water resources that are consistent with national accounts principles. This implies that we look for exchange values that exclude consumer surplus. While water resources provide a range of benefits, in this paper we follow the measurement boundary of the System of Environmental Economic Accounting (SEEA) Central Framework and restrict ourselves to the extractive use or provisioning service of various types of water resources, surface- ground-, and soil water as recorded in the physical supply and use tables. The main users/uses that we value are agriculture (predominantly soil water), the water supply sector (mainly surface and groundwater) and industries (surface and sea water primarily for cooling). We obtain a value of water resources for the Netherlands in 2010 of approximately 26 billion euros, which is about 10 percent of the value of natural capital currently included in the Dutch balance sheet. We find that the resource rent method has limited feasibility due the occurrence of negative rents or difficulties to identify the return to water in the rent. The replacement cost method has better potential but more research is clearly needed to improve estimates.

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## 1. Introduction<sup>1</sup>

The need to treat water as an economic good has been recognized as an essential component of integrated water resources management [1]. For instance, the valuation of water is requested by the Water Framework Directive [2] in articles 4 and 9. In the statistical community, concurrent with the surge of interest in natural capital and wealth accounting (e.g. the World Bank's Wealth Accounting and the Valuation of Ecosystem Services partnership), there is a growing demand to value water resources as they constitute an important part of the natural capital base. According to the 2008 System of National Accounts (SNA) [3], water resources need to be valued as part of the National balance sheet in situations when their scarcity leads to use restrictions. The System of Environmental Economic Accounting (SEEA) Central Framework [4] – a satellite system to the SNA – discusses valuation of water and the SEEA Water [5] dedicates a whole chapter to the valuation of water resources. To date there are only a few countries that have experimented with valuing water resources in an accounting context, most notably Mexico (focussing on the depletion of water resources) [6], Australia [7] and Namibia [8]. It appears that so far no country has been able to come up with credible estimates.

In the environmental economics literature there is a growing experience with the valuation of various types of water resources according to a range of techniques [9,10]. For the choice of valuation technique, the context of use is very important [11]: many of the traditional valuation techniques such as contingent valuation are welfare based assessments which include consumer surplus whereas integration in the national accounts requires consistency with national accounts principles. The National accounts aim to measure so-called exchange values, which are the prices willing buyers and sellers transact goods and services for, hence excluding consumer surplus.

The objective of this article is to obtain an experimental valuation of Dutch water resources that is consistent with national accounts principles. Hereto, we will assess several valuation techniques, in particular the resource rent and replacement cost approach. The implication of using an accounting approach is that we try to be comprehensive, covering water uses by all economic activities, rather than focusing in depth on the valuation of water use in one specific sector.

Water resources provide a range of benefits, which can be described and classified in various ways. The SEEA Central Framework has a broad recognition of natural resources in physical terms (in national accounts parlance 'extends the asset boundary of the SNA') and supplements the monetary description of economic activities contained within the national accounts with a physical picture of the dependency of the economy on flows from and to the environment. Its valuation scope is fully aligned with the SNA (in national accounts parlance it 'keeps the SNA production boundary intact'). It is only in the context of the SEEA Experimental Ecosystem Accounting (SEEA EEA) [12] that the production boundary is extended in order to recognize the contribution ecosystems make in the form of ecosystem services. In that regard, water resources (e.g. considered as aquatic ecosystems) may be analyzed in terms of various services they provide, such as provisioning services (e.g. drinking water); regulating services (e.g. breakdown of pollutants in surface and ground water); and, cultural services (e.g. recreation). Some of these services will contribute to outputs (or benefits) that are already captured in the national accounts, although the contribution of water resources is not being explicitly recognized; others will lie outside the SNA production boundary.

The scope of this article is restricted to valuing the physical flows that are recognized in the SEEA Central Framework [4] as crossing the boundary from the environment to the economy. This can be considered as the extractive use of water resources or from an ecosystem accounting perspective as the provisioning service of water. The values that we obtain although conceptually consistent with accounting principles, will therefore likely go beyond the scope of the SNA.

Statistics Netherlands has a long tradition in water accounting. The NAMWA (National accounting Matrix including Water Accounts) [13] consists of three types of accounts: water use, emissions to water, and regional water accounts. The NAMWA also separately identifies transactions including

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<sup>1</sup> The views expressed are those of the authors and do not necessarily correspond with the official point of view of Statistics Netherlands.

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