DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS
STATISTICS DIVISION
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System of Environmental Economic Accounting

SEEA Central Framework update

Scoping note for issue D4: "Consideration of water as a produced asset"

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Note: This Scoping Note has been prepared in the context of the SEEA Central Framework update, mandated by the United Nations Statistical Commission in 2024. A set of 29 issues was identified for the update process and endorsed by the United Nations Statistical Commission in 2025. As an initial step, Scoping Notes were developed for each issue to elaborate on its description and provide a common understanding of the work required to fully investigate and formulate recommendations for the updated SEEA Central Framework. Each Scoping Note was prepared by a lead author and discussed in the relevant Task Team. They were subsequently reviewed by the SEEA CF Technical Committee and the UNCEEA, and approved by the SEEA CF Technical Committee.

1 Background to the issue

1. Issue D4 is "Consideration of water as a produced asset (e.g. water in artificial reservoirs)" in the SEEA Central Framework issue update list. Issue D4 is described as:

> "This was also an issue during the SEEA CF 2012 revision, which may need to be revisited. Currently the SEEA CF does not consider water (such as in artificial reservoirs) as a produced asset, but instead only records production at the point the water is abstracted from a water body (natural or artificial). Further discussion is needed on the appropriate recording, considering also the link to the SNA production boundary."

2. The current SEEA Central Framework (SEEA-CF) does not consider water in artificial reservoirs as a produced asset. Instead, production is only recorded at the point where water is abstracted from any water body (natural or artificial). This treatment, which, as noted in the description in the update list, was debated in previous SEEA revisions, aligned with the 2008 SNA but overlooks the significant human intervention required to create and manage artificial reservoirs.

3. The paper re-examines this issue for the SEEA-CF update, motivated by conceptual advances in ecosystem and water accounting and the recent update to SNA 2025, and the adoption of the 2021 SEEA-Ecosystem Accounting (SEEA-EA).

4. There are close links between the data recorded in water asset accounts and ecosystem accounts. For example, in the measurement of ecosystem assets, which includes all water bodies (a subset of which are artificial reservoirs), ecosystem condition and the measurement of water-related ecosystem services, including a possible new service, water storage.

5. Discussion of water accounts and the links between the SNA, SEEA-CF and SEEA-EA can be confused by the terminology used. To minimise confusion, definitions of water stocks and flows from the 2025 SNA, SEEA-CF, SEEA-EA and the Central Product Classification (CPC) are provided as an Annex to this paper. This includes the definition of the product CPC 1800 'natural water'. Discussions with water industry experts can also be hindered by their use of different terms or the same terms with varying meanings.

2 Motivation for considering a change to the SEEA Central Framework

6. Treating water in artificial reservoirs as a produced asset better reflects the economic reality and management required for such water. Substantial human intervention, including construction, regulation, and ongoing operational management, is required to impound, store, and distribute reservoir water. This treatment aligns with the distinction between plantation forests and natural forests in the 2025 SNA and the 2012 SEEA-CF, based on the degree of management.

7. The 2025 SNA defines:

   a. **Inventories:** Produced assets that consist of goods and services which came into existence in the current period or in an earlier period, and that are held for sale, use in production or other use at a later date.
   b. **Inventories (excluding produced natural resources):** Produced assets that consist of goods and services which came into existence in the current period or in an earlier period, and that are held for sale, use in production or other use at a later date. Work-in progress related to biological resources is excluded, and grouped together with other natural resources. (AN12)
   c. **Natural resources**: Assets that naturally occur, such as land, mineral and energy resources, water resources, and animal, tree, crop and plant resources, that have an economic value and over which ownership may be enforced and transferred. Environmental assets over which

ownership rights have not, or cannot, be enforced, such as high seas beyond national jurisdiction and most parts of the atmosphere, are excluded. (AN3)

d. **Produced assets** are non-financial assets that have come into existence as outputs from processes that fall within the production boundary of the SNA; produced assets consist of fixed assets, inventories, and valuables Production: Activity carried out under the responsibility, control and management of an institutional unit, that uses inputs of labour, capital and goods and services to produce outputs of goods and services.

e. **Production boundary:** Boundary of what constitutes production, including the production of goods and services supplied, or intended to be supplied, to units other than their producers; the own-account production of goods and knowledge-capturing products retained by their producers for their own final consumption or gross capital formation; the own-account production of housing services by owner occupiers; and the production of domestic and personal services by employing paid domestic staff.

8. The water in artificial reservoirs is not naturally occurring. The water is stored via process of production. The water supply industry utilises capital (e.g., a dam wall), labour, and other goods and services to build and manage reservoirs, often including the management of the surrounding area, with the intention of supplying water to others for use as drinking water, irrigation, cooling, or hydroelectric power generation.

9. The degree of human intervention needed to store and manage water for future supply varies. As such, a key consideration is what definition of an artificial reservoir to use for defining water production. The SEEA-Water defines artificial reservoirs as "*man-made reservoirs used for storage, regulation and control of water resources*". The International Commission on Large Dams has a definition. In addition to large dams, there are smaller reservoirs, such as farm dams and household rainwater tanks, while some rivers and lakes have smaller structures (e.g., weirs and locks) for managing water to prevent floods or facilitate water transport.

10. Considering water in reservoirs as a produced asset, specifically an inventory of CPC 1800 Natural Water, more accurately depicts the value created by storing water for future use, as well as reflecting the displacement of water in time and space resulting from artificial reservoirs. This approach has significant implications for the supply-use tables, inventory accounts, and the valuation of water, potentially leading to more robust data for decision-making and policy analysis.

3 Nature of the proposed change and research questions

11. The proposal is to classify water in artificial reservoirs as a produced asset, specifically an inventory of CPC 1800 'natural water'. In this, the water is produced when it enters an artificial reservoir. Key questions include:

    a. How would changing the production boundary of water in artificial reservoirs in the SEEA-CF align with the treatment of natural resources and inventories in SNA?

    b. What are the implications for accounting tables, including the addition of inventory columns and the division of water supply industries (e.g., separating water storage and distribution)?

    c. How should losses (e.g., evaporation from reservoirs) be recorded and attributed?

    d. How should the infrastructure and management of water to facilitate water transport or prevent flooding be treated?

e. What guidance is needed for defining artificial reservoirs, recording managed aquifer recharge, rainwater harvesting by households, and other emerging water management practices?

f. What guidance is needed to compile accounts that include water in artificial reservoirs as an inventory?

g. What are the broader implications for consistency between SEEA-CF, SEEA-EA, SEEA-Water, and the SNA?

4 Links to other SEEA CF update issues

12. Consideration of water as a produced asset requires linking to other SEEA CF update issues. This includes:

a. Issues D2: Water Quality and D7 Water valuation. If water in reservoirs is a produced asset, then the water in storage is an inventory of CPC 1800 Natural Water[1]. Part of the reservoir (i.e., the dam wall) is also a produced asset, which is relevant for valuing the ecosystem assets. Artificial reservoirs (F3 in the Global Ecosystem Typology). D7 mentions the value of hydropower but notes it is likely to be discussed in the valuation of renewable resources. Water quality has a significant impact on the value of water.

b. Issue B2: Further clarifying treatment of losses (e.g. energy, water). Several losses are not fully described in the SEEA-CF, including water losses. Evaporation for artificial reservoirs is one type of loss. Treatment of these losses would also affect valuation.

c. Issue A1: Overview of the links between SEEA CF and SEEA EA: Water is recognised in the SNA, SEEA-CF and SEEA-EA, and the effects of the proposed change must be considered (e.g., the definition and treatment of stocks and flows).

d. Issue A4: How SEEA CF accounts can be made spatially explicit: A key feature of water is that its availability changes between places and over time. The reason for artificial reservoirs is to collect water (produce water) where and when it is abundant and store it for where and when it is needed.

5 Existing materials

13. Potential materials that may be considered in developing the Guidance note include (but are not limited to):

a. Vardon, M, Oleson, K., May, S. 2024. A full account of water. Paper for the 30th Meeting of the London Group on Environmental Accounting, Washington DC, USA. https://seea.un.org/sites/seea.un.org/files/session_8_position_paper_water_accounting.pdf

b. Nagy, M., Alfieri, A., and Vardon, M. 2009. Water in artificial reservoirs a produced asset? 14th Meeting of the London Group on Environmental Accounting. Canberra, 27-30 April 2009. https://www.researchgate.net/publication/242784852_Water_in_artificial_reservoirs_-_A_produced_asset

c. Obst, C. 2010. Issue #16: The treatment of water in artificial reservoirs. Outcome paper for the development of the 2012 SEEA Central Framework.

d. Vardon, M. J., Thi Ha Lien Le, Martinez-Lagunes, R., Pule, O. P., Schenau, S., May, S., and Grafton, R.Q. (2025). Accounting for water: A global review and indicators of best practice for

[1] Note the use of "Nature water" as the name of the product CPC 1800 confuses many water accounting discussions. See Annex

improved water governance. *Ecological Economics*. https://doi.org/10.1016/j.ecolecon.2024.108396

e. International Commission on Large Dams (ICOLD) https://www.icold-cigb.org/

f. Chen, Y. & Vardon, M. (2024). Accounting for water-related ecosystem services to provide information for water policy and management: an Australian case study. *Ecosystem Services*. 227, 108396. https://doi.org/10.1016/j.ecoser.2024.101658

14. In developing the guidance note, it will be necessary to identify the relevant experts and stakeholders to draft the content and ensure appropriate consultation. These experts and stakeholders have not been identified at this stage.

6 Annex Water accounting definitions.

Table A1. Asset definitions and classifications in SEEA-CF, SEEA-Water and SEEA-EA

2025 SNA	SEEA Central Framework and SEEA-Water	SEEA Ecosystem Accounting – Global Ecosystem typology	Notes for determining the scope and definitions of water assets for valuation
Definition			
Water resources (AN34) consist of surface and groundwater resources used for extraction to the extent that their scarcity leads to the enforcement of ownership and/or use rights, market valuation and some measure of economic control. If it is not possible to separate the value of surface water from the associated land, the whole should be allocated to the category representing the greater part of the total value	Water resources consist of fresh and brackish water in inland water bodies, including groundwater and soil water. (SEEA CF, para 5.474)		SNA recognizes the need to separate the value of water from land. Valuation is not considered in SEEA-CF
Classification			
	Surface water • Rivers and streams • Lakes • Artificial reservoirs Snow, ice and glaciers	Freshwater • F1 Rivers and streams • F2 Lakes • F3 Artificial reservoirs T6 Polar-alpine (cryogenic)	Direct correspondence between SEEA-Water, SEEA Central Framework and SEEA Ecosystem Accounting
	Groundwater	• SF1 Subterranean freshwater • SF1 Anthropocentric subterranean freshwater • FM1 Semi-confined transitional waters	SEEA Ecosystem Accounting sub-divides groundwater into three classes. In the SEEA-Water and SEEA Central Framework, groundwater includes all these sources and could be similarly divided.
	Soil water	• Water use in rainfed agricultural and cultivated forest ecosystems	The SEEA-Water and Central Framework only identifies soil water, which is found in all ecosystem types with soil. However, in practice the use of soil water is only estimated for rain-fed agricultural ecosystems. The use of soil water can be shown by the ecosystem types used in the SEEA Ecosystem Accounting.

Note: SEEA -EA/GET also includes Transitional TF1 Palustrine wetlands, MFT1 Brackish tidal systems, M1 Marine shelf, M2 Pelagic ocean waters, M3 Deep sea floors. The SEEA-Water and Central Framework does not explicitly recognize these assets although water assets consist "*of fresh and brackish water in inland water bodies, including groundwater and soil water"* (SEEA Central Framework para 5.474) and these would likely be recorded as abstractions from surface water (i.e. lakes). The SEEA-Water included seas and oceans as a source of water for desalinization and cooling water as well as receiving return flows from the economy and river outflows. The ocean accounts described in SEEA Ecosystem Accounting do not consider marine ecosystems as a possible source of water.

Table A2.Definitions of water flows recorded in the SNA, SEEA-CF, SEEA-Water, and SEEA-EA

Abiotic flows as defined in SEEA-EA	
Abiotic flow	are contributions to benefits from the environment that are not underpinned by, or reliant on, ecological characteristics and processes. (SEEA-EA, para. 6.35)
Water supply-related ecosystem services defined in SEEA-EA	
Water supply service (water provisioning)	reflect the combined ecosystem contributions of water flow regulation, water purification, and other ecosystem services to the supply of water of appropriate quality to users for various uses including household consumption. (SEEA-EA, p. 131)
Water flows defined in SEEA Central Framework and SEEA-Water	
Water (natural resource)	Natural resources include all natural biological resources (including timber and aquatic resources), mineral and energy resources, soil resources and water resources. (SEEA Central Framework, paras 2.101, 5.18) Water abstraction is defined as the amount of water that is removed from any source, either permanently or temporarily, in a given period of time. (SEEA Central Framework, para 3.195)
Wastewater *SEEA-Water*	Water which is of no further immediate value to the purpose for which it was used or in the pursuit of which it was produced because of its quality, quantity or time of occurrence. However, wastewater from one user can be a potential supply of water to a user elsewhere. It includes discharges of cooling water. (EDG)
Wastewater *SEEA-CF*	Wastewater is discarded water that is no longer required by the owner or user. (SEEA Central Framework, para 3.86)
Recycled water *SEEA-Water*	The reuse of water within the same industry or establishment (on site).
Reused water *SEEA-Water*	Wastewater delivered to a user for further use with or without prior treatment. Recycling within industrial sites is excluded. (EDG)
Reuse water *SEEA-CF*	Reused water is wastewater supplied to a user for further use with or without prior treatment, excluding the reuse (or recycling) of water within economic units. (3.207)
Water in the Central Product Classification (CPC)	
Natural water (CPC 1800)	This subclass includes: potable and non-potable water, suitable for further use, including: • treated water (e.g., from desalination plants, water treatment plants) • untreated water (e.g., obtained directly from natural sources) This subclass also includes: • used water suitable for further use This subclass does not include: • sea water, cf. 16200 • steam and hot water, cf. 17300 • mineral waters containing added carbon dioxide, cf. 24410 • waters individually bottled as beverages, cf. 24410 • distilled water, cf. 34250 • sewage and other wastewater, i.e. water not suitable for further use, cf. 39990 (CPC, p. 197)
Bottled waters, not sweetened or flavoured (CPC 24410)	This subclass includes waters individually bottled as beverages, including: • aerated (carbonated) waters • mineral waters (natural or artificial) This subclass does not include: - ice and snow, cf. 17400 - natural water (i.e. non-bottled), cf. 18000 - sweetened or flavoured water, cf. 24490