

SEEA CENTRAL FRAMEWORK · 2028 UPDATE · GUIDANCE NOTE D7

Valuing Water Resources in the SEEA Central Framework

The standard method prices water near zero because regulated tariffs don't reflect scarcity.

Kirsten L. L. Oleson (lead)

Silvia Ferrini · Alice Bartolini · Henry Behr · Eli Fenichel · Alec Jacobs · Carl Obst · Vittoria Reas · Michael Vardon · Travis Warziniak

with contributions from Task Team D and the SEEA CF Technical Committee

32nd Meeting of the London Group on Environmental-Economic Accounting · Guatemala City, Guatemala · 7–9 September 2026



Australian
National
University

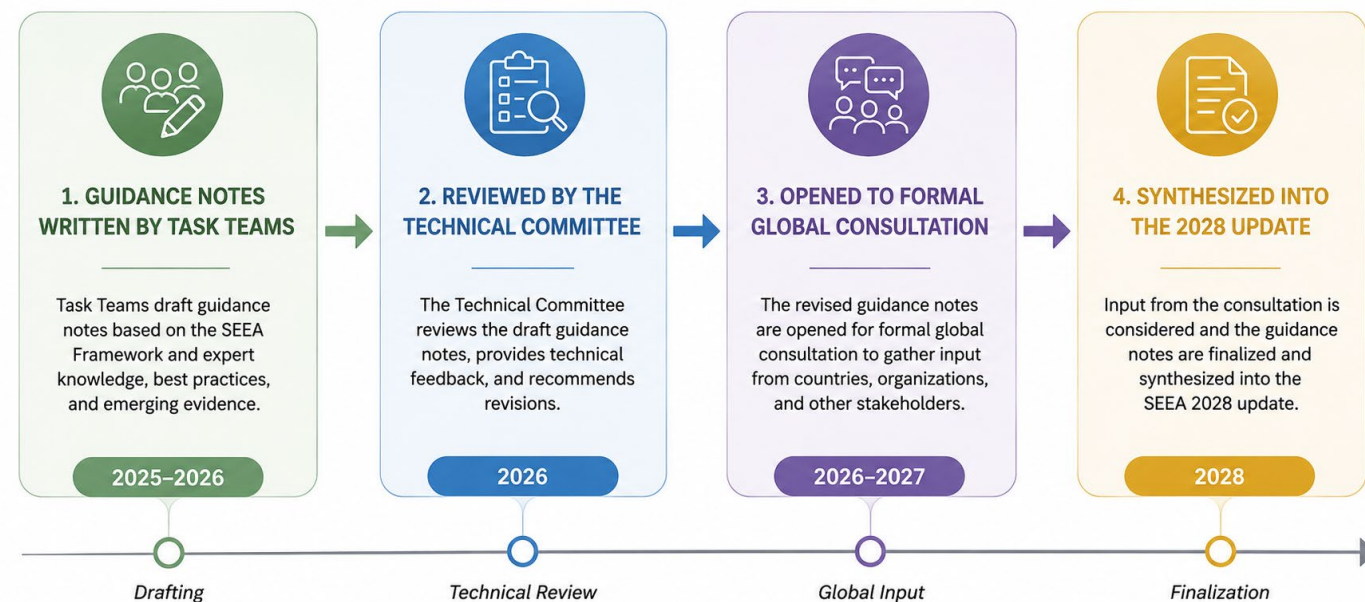
Yale



This note is one issue inside a larger revision

Why a revision

- Update of the SEEA Central Framework (2012) mandated by the 55th Session of the UN Statistical Commission
- SNA 2025 §35.50 separately delegates natural resource depletion valuation to this SEEA CF update process
 - **water** is the resource category that delegation left most unresolved.



One water account, three different users

1

A water ministry

learns where scarcity is concentrated and what a drought would cost.



3

A statistics office

gets a defensible number for water's contribution to output, by sector.



2

A finance ministry

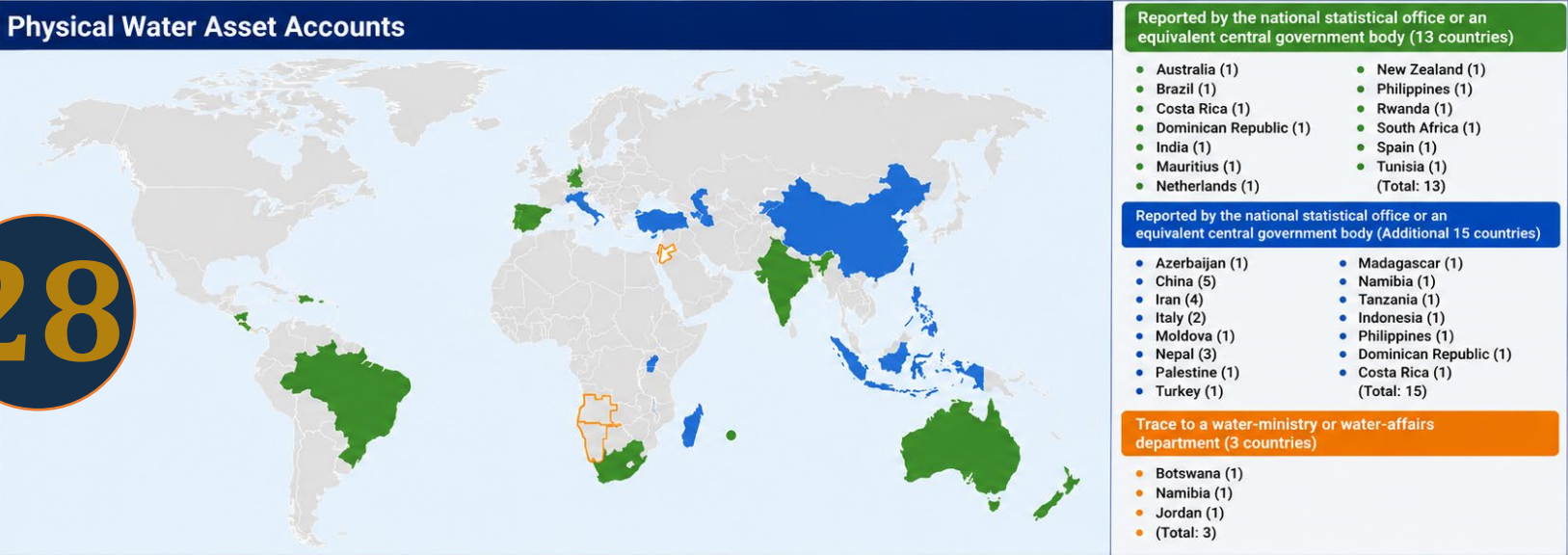
gets a basis for water pricing reform and for weighing infrastructure investment against other capital spending.



Physical accounts do not translate into monetary accounts

→ *This note proposes the missing operational guidance*

28



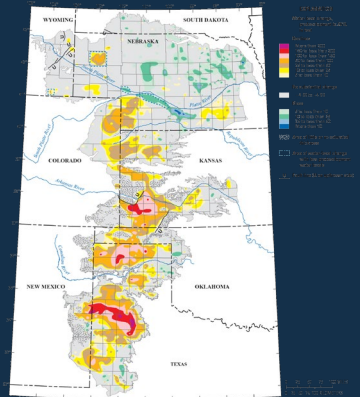
2



0

national statistical offices have published a **balance sheet entry** derived from a formal NPV projection of resource rents (*Reas et al. 2025*)

One sub-national example going from annual flow to asset value (*Fenichel et al. 2016*)



Why the standard method fails for most water

A water bill prices delivery, not the water itself.

The standard resource rent method returns near-zero for most water.

Not because water is genuinely abundant. The price is a regulated tariff that covers operating expenses.

Example: Water-scarce basin

records zero resource rent

Water stays scarce. The accounts simply priced the **service**, instead of the **resource**.

→ *Fixing that failure starts with naming what's actually being valued.*



Three valuation targets, one shared confusion

Current SEEA CF guidance conflates these into a single undifferentiated “value.” This note names them and assigns each to the account it belongs in.



Annual flow value

SUPPLY & USE TABLE

$$F_t = R_t \cdot q_t$$

The value of water extracted this period, above the cost of extraction.



Stock asset value

BALANCE SHEET

$$V = \sum_{t=1}^T \frac{F_t}{(1+r)^t}$$

Present value of the future stream of resource rents. What national wealth accounting needs.



Depletion value

ADJUSTED NDP

$$D_t = \bar{p} \cdot \max(0, q_{t,\text{net}} - g_t)$$

The reduction in stock value attributable to extraction this period.

→ Get F_t wrong, and V and D_t inherit the error.

Getting from zero rent to a defensible price

A

TIER 1: use if available

Option A: observed market prices, where transactions are competitive, arm's-length, and spatially matched to the resource.

TIER 2: exchange-value-compatible estimation, with a conditional sub-tier (C, D, F)

B

Replacement cost

Cost of the next-best alternative supply. Applies only where it would genuinely be built.

C

Residual value / production function

Conditional: water must be the binding constraint on output.

D

Hedonic pricing

Conditional: needs a competitive property or water-rights market.

E

Benefit transfer

Interim measure only, from a documented Tier 1/2 source study.

F

Travel cost

Conditional: must recover a price, not a consumer-surplus estimate.

Ineligible at any tier: stated preference methods and surplus-based travel cost. They measure welfare, including consumer surplus, rather than exchange value.

→ Tier 1 whenever it exists; Tier 2 only as far as the evidence requires.

Exchange value and welfare value align (for changes, not levels)

Fenichel, Obst, and Wentland (2024)

IN LEVELS

Welfare value always exceeds exchange value.

Exchange value is price times quantity: the rectangle.
Welfare value adds the consumer-surplus triangle above it, and for an essential good like water, that triangle has no natural zero to measure from.

IN CHANGES

The two align once the change is priced correctly.

F_t , V , and D_t are all changes or flows, not levels. Valued at a volumetric (index-based) price rather than a single point-in-time price, the change in exchange value equals the change in welfare, exactly at the margin and closely for larger changes.

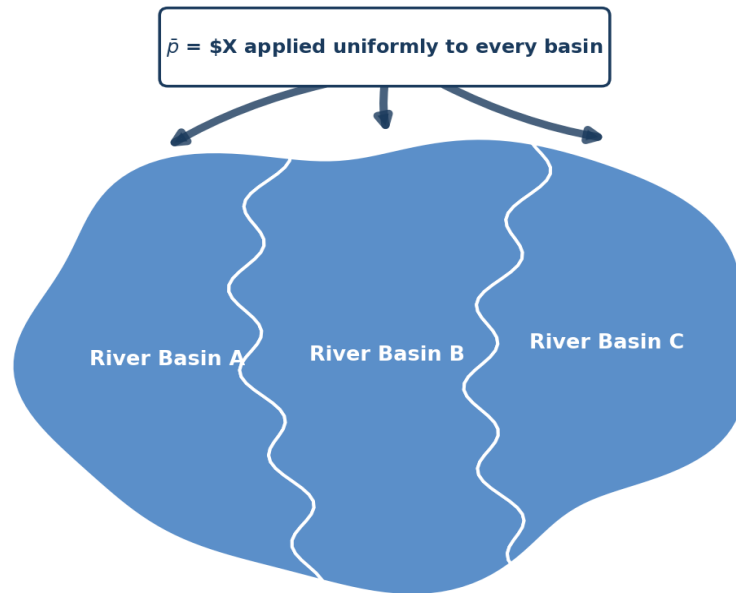
This is what licenses Tier 1/2 pricing: applied to changes, with volumetric prices, exchange value is the welfare-consistent measure.

Compile at the river basin, not the nation

A correctly priced account can still mislead at the wrong spatial scale.

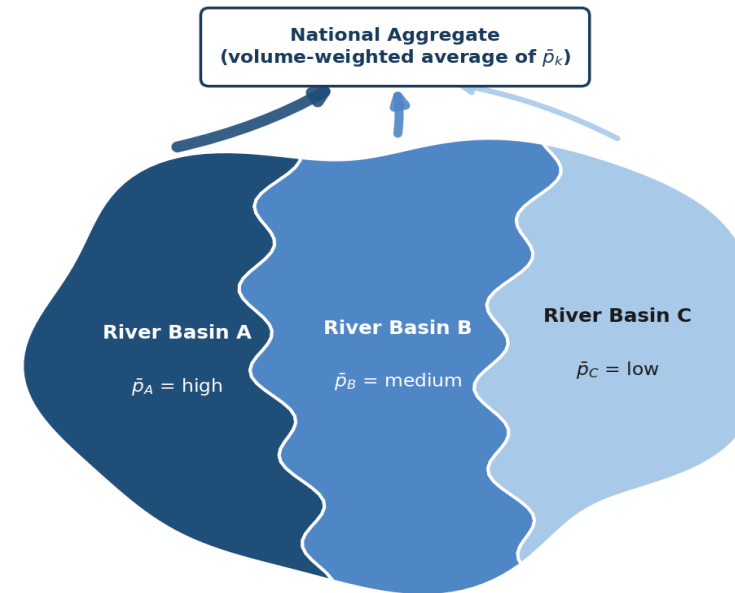
Figure 3.2. Spatial Aggregation and the Modifiable Areal Unit Problem

✗ Top-down: national $\bar{p} = V_{\text{national}}/S_{\text{national}}$



Suppresses scarcity variation: the modifiable areal unit problem (MAUP).

✓ Bottom-up: estimate $\bar{p}_k$ at river-basin level, then aggregate



Preserves spatial heterogeneity, supports river-basin governance. Larger basins carry more weight in the national figure.

Recommendation 6: compile accounts at the river-basin level; national aggregates are summary statistics for communication only.

The other four: scope, reconciliation, quality, extremes

These don't change how you price water. They keep the accounts internally consistent once it's priced.

REC. 1 · SCOPE

Not every water body belongs in the monetary account.

The test: an enforceable use right, SNA-recorded output, and a recorded PSUT entry. Hydropower and cooling qualify. Without these, the water body moves to Ecosystem Accounts as a boundary call on scope. Its value stands regardless.

REC. 3 · RECONCILIATION

The flow account and the stock account have to agree.

The MSUT values extraction at $F_t = R_t \cdot q_t$; the asset account values it through the OCV entry. A large or persistent gap between them means the methods are inconsistent. Rounding error alone won't produce it.

REC. 7 · QUALITY

A quality loss is a revaluation.

Contamination that shrinks usable stock is recorded as an other change in volume (OCV), a balance-sheet entry. Depletion counts only extraction beyond recharge. Conflating the two misstates NDP.

REC. 8 · EXTREMES

Three edge cases, three different answers.

Near exhaustion: cap the depletion charge at substitute cost. Genuine abundance: zero depletion is correct, and V can still be positive. Missing recharge data: report $D_t = NA$, distinct from a true zero.

→ These four are about trust in the account, not the price of water.

Eight recommendations, in three clusters

REC. 1, 6

Scope & Scale

Rec 1: an enforceable use right, SNA-recorded output, and a PSUT entry qualify a water body for the monetary account; otherwise it moves to Ecosystem Accounts.

Rec 6: compile accounts at the river-basin level instead of the national average.

REC. 2, 4, 5

Valuation & Methods

Rec 2: names three valuation targets: F_t (flow), V (stock), and D_t (depletion).

Rec 4: Tier 1: observed market prices, used whenever available.

Rec 5: Tier 2: replacement cost, residual value, hedonic pricing, or benefit transfer.

REC. 3, 7, 8

Reconciliation & Quality

Rec 3: the flow account and the stock account must agree, reconciled through a documented OCV entry.

Rec 7: a quality loss is a revaluation, recorded as an OCV entry rather than a depletion charge.

Rec 8: near exhaustion, genuine abundance, and missing recharge data each get explicit treatment.

Full text of all eight recommendations, with proposed SEEA CF paragraphs to update, is in §4 of the draft note.

Six questions, open for Global Consultation (§5.3)

a

Do you record reservoir waters separately from lakes in the physical asset account?

GN D4 is separately deciding whether reservoirs are produced assets. Global Consultation favored that shift, but this note still treats them under AN.34 as the baseline.

b

Should soil water be in scope of valuation?

c

Should glaciers and seasonal snowpack be in scope of valuation?

d

Do you record an AN.34 value for hydroelectric, thermal cooling, or canal water? If not, what's the barrier?

e

Does the new AN.32 hydroelectric classification affect how you report water resources?

AN.32 (hydropower capacity) and AN.34 (water) use different mechanics: depletion vs. OCV. That's a live risk of double- or zero-counting the same resource rent.

f

What discount rate do you use, and is a bounded range (e.g. 2–5%) preferable to country discretion?

SEE THE ACCOUNTING CHAIN IN ACTION

An interactive simulator

Adjust extraction volume, recharge rate, and the substitute-price ceiling. Watch how each parameter moves the depletion charge, the annual flow value, and the OCV reconciliation (Recommendations 2, 3, 8).

`olesonlab.github.io/seea-water-simulator`

Thank you

Kirsten Oleson · koleson@hawaii.edu · on behalf of Task Team D