

SEEA Central Framework 2028 Update

Guidance Note B6

Pressure Accounts: Recording Residual Flows to Ecosystem Types

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Structure of the Guidance Note and This Presentation

1

Background and Context

Statistical gap; motivation; links to other SEEA CF update issues; stakeholders

2

Conceptual Framework

SEEA EA and SNA 2025 treatment; CBS North Sea account; EEA/JRC pilots; spatial allocation models

3

Alternative Conceptual Options A–G

Six account design options plus a modular framework; comparative assessment

4

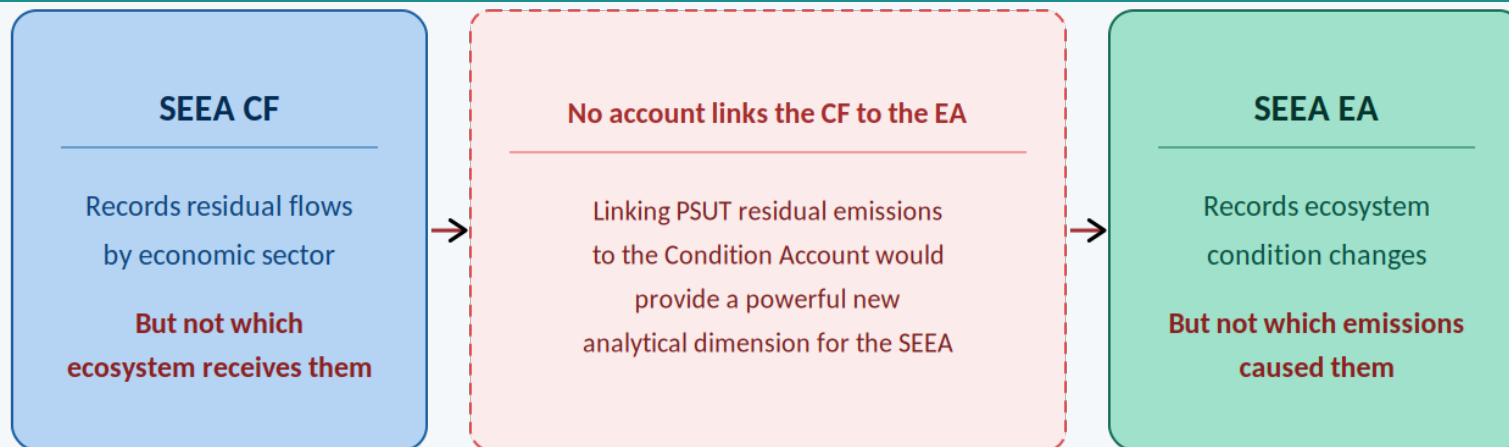
Recommendations, Global Consultation, and Research Agenda

Three recommendations; proposed Global consultation questions

Block 1 — Background and Context

Why a Pressure Account? What is in scope?

The Core Statistical Gap



The Pressure Account fills this gap

- The SEEA CF PSUT records residuals (emissions, discharges, releases) attributed to economic units but does not identify which ecosystem assets or ecosystem types receive them.
- The SEEA EA Condition Account records changes in ecosystem state but does not contain an account explicitly linking those changes to residual flows in the SEEA CF.
- SEEA CF already acknowledged this gap: it cross-referenced 'SEEA Experimental Ecosystem Accounting' — a cross-reference the updated SEEA CF could replace with a formal Pressure Account structure.
- The Pressure Account could provide the connecting bridge: spatial allocation of residual flows to receiving ecosystem types, and their translation into ecological pressure indicators.

Scope: What Is — and Is Not — in the Pressure Account*

IN SCOPE — residual flows recorded in the SEEA CF Physical Flow Accounts

Emissions to air (air pollutants, greenhouse gases, particulate matter)

Discharges to water (nutrients, BOD/COD, toxic substances, wastewater)

Releases to land (solid waste, mining waste, persistent soil contaminants)

Diffuse releases from dissipative product uses (fertilisers, pesticides, road salts, pharmaceuticals)

Emissions from mobile sources (road, aviation, shipping) — with specific spatial attribution challenges

EXCLUDED — other pressure types

Pressures from harvesting of natural resources (fish, timber)

Pressures from land-use change (urbanisation, habitat conversion)

Pressures from passive environmental uses (marine transport, noise, light, tourism)

Pressures from invasive species and biological introductions

Natural disturbances and extreme natural events

Pressures attributable specifically to climate change

*Based on the Concept Note

Note: some excluded pressure information can be derived from existing SEEA CF accounts (land accounts, physical asset accounts), but no new account structures are proposed for these types.

Links to Other SEEA CF Update Issues

Issue A1 SEEA CF–SEEA EA links

Pressure Account is a primary mechanism linking PSUT physical flows to SEEA EA Condition Account entries.

Issue A2 Indicators

Pressure Account provides a foundation for deriving indicators relevant to SDGs and Kunming-Montréal GBF.

Issue A4 Spatial accounts

GN A4 identifies residual flow accounts as primary candidates for spatial disaggregation; B6 applies that framework.

Issue A6 Links to policy

Structured basis for presenting residuals in a form relevant to pollution control and biodiversity policy (DAPSIR).

Issue A8 Flow–asset linkages

Pressure Account sits at the interface between Physical Flow Accounts and Ecosystem Asset Accounts.

Issue B1/B5 PSUT description

If Pressure Account extends the PSUT, the PSUT environment column description in GN B1/B5 requires updating.

Issue B7 Waste accounts

Coordination needed on which waste-related residual flows should feed the Pressure Account.

Issue C6 Environmentally damaging subsidies

Pressure Account provides physical context for policy analysis linking subsidised activities to ecological effects.

Block 2 — Conceptual Framework

Existing treatments, key precedents, and the transformation chain

The Existing Evidence Base

SEEA EA & SNA 2025

SEEA EA (§A1.17) mandates spatial disaggregation of PSUT residuals as prerequisite for linking to Condition Account. SNA 2025 (§35.66) explicitly envisions sub-national PSUTs linked to ecosystem condition.

CBS Dutch North Sea Account (Bogaart et al., 2023)

Most fully realised Pressure Account to date. Matrix linking economic sectors (NACE) to marine ecosystem types. Applies 'mirror image PSUT' logic: pressures caused by economic units, received by ecosystem assets. Primarily qualitative/experimental.

EEA/JRC Pilot Nutrient Pressure Accounts (2020)

European-scale spatial allocation of N/P pressures to MAES ecosystem types. Built on SEEA EA Ecosystem Extent Account spatial infrastructure. Demonstrates feasibility using existing data systems.

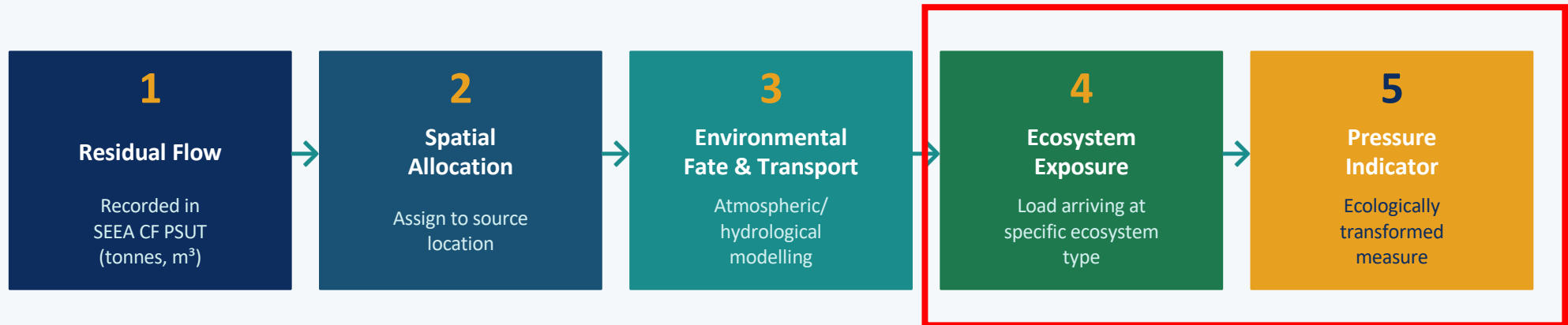
FDES Component 3 & INCA programme

FDES covers residuals (3.1 air, 3.2 wastewater, 3.3 waste) — primary data infrastructure. Does not include spatial disaggregation by ecosystem type (the specific gap B6 addresses). INCA integrates N pressure in agro-ecosystem condition accounts.

Spatial modelling frameworks

EMEP (atmospheric deposition), MONERIS/GREEN/GREENer (nutrient loads), OSPAR/MSFD (marine pressures) provide established transformation infrastructure. All require a conversion step: PSUT emission → ecosystem-type pressure indicator.

The Transformation Chain: A Central Challenge Across All Options



Worked example:

1. NO_x emissions from road transport → recorded in Air Emissions Account (PSUT)
2. Spatial allocation via traffic density proxies → assigned to source location
3. Atmospheric dispersion modelling → nitrogen deposition field
4. Overlay with IUCN Global Ecosystem Typology map → load per ecosystem type
5. Pressure indicator: kg N deposited / ha of forest ecosystem type / year

Two Account Types: Environmental Loading Account and Pressure Account

Environmental Loading Account

- Entries are residual flow quantities from the PSUT spatially allocated to ecosystem types
- Recorded in the physical units of the original residual flow data (tonnes, kg, m³)
- No further transformation beyond spatial allocation
- Immediately compilable for countries with PSUT infrastructure and spatial data
- Records what each ecosystem type receives — not whether it is ecologically significant

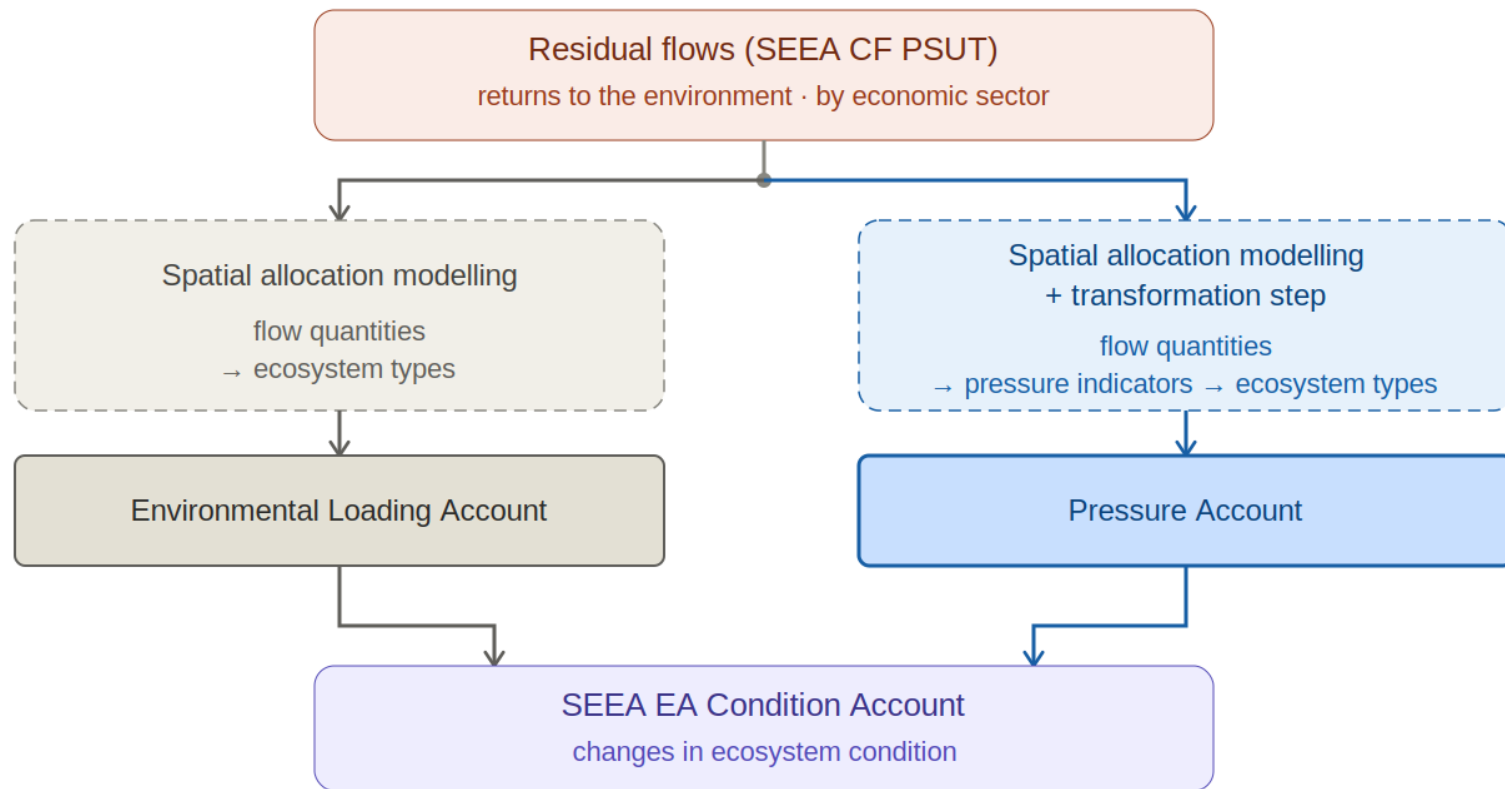
→
*evolves
to*

Pressure Account

- Entries have been transformed into ecological pressure indicators through a documented transformation step
- Units reflect ecological relevance (kg N/ha; BOD load per catchment)
- Transformation must be documented — it is analytical and sits outside the SEEA CF statistical accounting boundary
- Direct link to SEEA EA Condition Account variables
- Preferred long-term form — subject to global consultation (Question 1)

Both account types are valid within the modular framework provided entries remain traceable to PSUT residual flows.

Two Account Types: Environmental Loading Account and Pressure Account



Both account types are valid within the modular framework provided entries remain traceable to PSUT residual flows.

Block 3 — Accounting Options A–G

Six account designs plus a modular framework

Overview of Options A–G: The Design Space

Evaluated against four criteria: accounting consistency · bridge function (CF↔EA) · compilation feasibility · analytical clarity

A	PSUT Extension by Ecosystem Type — environment column disaggregated into ecosystem-type sub-columns	Account design
B	Stand-Alone Pressure × Ecosystem Matrix — separate table: residual/pressure rows × ecosystem type columns, derived from PSUT	Account design ★ recommended
C	Stand-Alone PSUT-Style Pressure Account — supply-use account with economic sectors as suppliers, ecosystem types as users	Account design (long-term)
D	Spatial Bridge Tables or Gridded Pressure Maps — georeferenced spatial data layer; not a tabular account in the SEEA sense	Compilation pathway
E	Environmental Medium-Based Pressure Accounts — structured by medium (air/water/soil), linking to ecosystem types	Compilation pathway
F	Ecosystem-Receiving Account — inverts organising logic: starts from ecosystem types and asks what pressures each receives	SEEA EA-complementary
G	Modular Framework — conceptual architecture + multiple implementation patterns; Options A–F as compliant options	Recommended framework

Option A — PSUT Extension by Ecosystem Type

A Minimal acceptable extension within the PSUT

Core idea

The environment column of the PSUT Use Table is disaggregated into sub-columns for ecosystem types. The disaggregation applies to the Residuals rows only — those are the only rows with entries in the environment column on the use side. PSUT balancing identity potentially still applies.

✓ Strengths

Smallest departure from adopted PSUT practice. Retains supply–use logic and link to economic sectors. Compatible with GN B1/B5 flexible column classification.

✗ Key weaknesses

No transformation — entries remain raw emission quantities, not pressure indicators (emission ≠ pressure). Risks conflation with existing Emissions Accounts.

Option A — PSUT extension by ecosystem type

Standard PSUT structure preserved · environment column disaggregated by ecosystem type on the use side only

Supply table					
Products / natural inputs	Production; generation of residuals			Flows from rest of world	Flows from environment
	Industries (classified by ISIC)	Households	Accumulation		
Natural inputs					Σ
Products					Σ
Residuals					Σ
Total supply					

Supply = use accounting identity · same economy columns both sides · same row categories

Use table								
Products / residuals	Intermediate consumption; use of natural inputs			Flows to rest of world	Environment — by ecosystem type (NEW)			
	Industries (classified by ISIC)	Households	Accumulation		Forests	Rivers	Coastal	Unattr.
Natural inputs								Σ
Products								Σ
Residuals								Σ
Total use								

NEW: environment column split by ecosystem type

Option B — Stand-Alone Pressure × Ecosystem Matrix ★ Recommended

B ★ Recommended for immediate adoption

Core idea

A separate table: residual flow/pressure categories as rows, ecosystem types as columns. Derived from PSUT but not itself a PSUT — no balancing identity required. Economic sector dimension optional as sub-rows.

✓ Strengths

All pressure types in one integrated table. Cleaner link to SEEA EA Condition Account. Avoids complicating the PSUT. Easier for policy users.

✗ Key weaknesses

Step removed from core SEEA CF — may be perceived as indicator table if transformation not carried out. Option B without transformation ≈ spatially disaggregated Emissions Account. Ecosystem type vs. asset choice is open (Question 2).

Option B — stand-alone pressure × ecosystem matrix

Residual flow / pressure category	Ecosystem types (SEEA EA classification)					Total
	Forests & woodland	Rivers & lakes	Coastal & marine	Cropland	Unattr.	
Atmospheric emissions (NO _x , SO _x , PM, GHG)	N dep. mol/ha/yr	N dep. mol/ha/yr	N dep. mol/ha/yr	N dep. mol/ha/yr		Σ
by economic sector ↓	Agriculture · Industry · Transport · Households · ...					
Water discharges (N, P, BOD, toxics)	—	kg N/yr per catchment	kg N/yr marine load	—	—	Σ
by economic sector ↓	Agriculture · Industry · Households · ...					
Releases to land (solid waste, contaminants)	t/ha	t/ha	t/ha	t/ha	t/ha	Σ
by economic sector ↓	Mining · Manufacturing · Households · ...					
Diffuse releases (fertilisers, pesticides)	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	Σ
by economic sector ↓	Agriculture · Households · ...					
Column total	Σ	Σ	Σ	Σ	Σ	Σ

Rows: residual flow or pressure categories derived from the PSUT (not additive across rows — different units)

Columns: ecosystem types consistent with SEEA EA classification

Cells: emission quantity (Environmental Loading Account) or pressure indicator (Pressure Account)

Sub-rows: optional sector dimension linking entries back to PSUT economic units

No supply-use balancing identity — column totals are formal sums within a pressure type only

Option C — Stand-Alone PSUT-Style Pressure Account

C Preferred long-term structure

Core idea

Supply-use account: economic sectors supply pressures; ecosystem types use them. Maintains supply–use accounting identity by accounting convention. Mirrors ecosystem service account logic in reverse. Proposed in Bogaart et al. (2023).

✓ Strengths

Formal accounting structure with supply/use sides and balancing items (imports/exports). Strongest bridge function. Conceptual symmetry with SEEA EA ecosystem service accounts.

✗ Key weaknesses

Pressure is not physically conserved — identity holds by convention, not mass balance. Rows not additive across pressure types (different units). Full transformation step required. The transformation step is external to the account. Risk of conflating emission with pressure.

Option C — PSUT-style Pressure Account

Pressures “supplied” by economic sectors · “used” by ecosystem types · supply = use identity

Supply table — pressure generated by economic sectors						
Pressure factor	Agriculture (NACE A)	Industry (NACE B–E)	Transport (NACE H)	Households (S14)	Import (abroad)	Total supply
Atmospheric pressure	NH ₃ , NO _x	SO _x , NO _x	NO _x , PM	NO _x , PM	transbnd.	= ∑ rows
Water pressure	N, P runoff	effluent	port runoff	wastewater	riverine	= ∑ rows
Land / soil pressure	pesticides	mine waste	—	solid waste	—	= ∑ rows
Total supply	= ∑ cols	= ∑ cols	= ∑ cols	= ∑ cols	= ∑ cols	Grand ∑

Use table — pressure received by ecosystem types						
Pressure factor	Forests & woodland	Rivers & lakes	Coastal & marine	Grassland / cropland	Exports & unattrib.	Total use
Atmospheric pressure	N dep. /ha	N dep. /ha	N dep. /ha	N dep. /ha	transbnd.	= ∑ rows
Water pressure	kg N/yr (leaching)†	kg N/yr	kg N/yr	kg N/yr	riverine	= ∑ rows
Land / soil pressure	t/ha	t/ha	t/ha	t/ha	—	= ∑ rows
Total use	= ∑ cols	= ∑ cols	= ∑ cols	= ∑ cols	= ∑ cols	Grand ∑

Supply rows = pressure types generated by sectors. Row totals (= ∑ rows) sum across sectors for one pressure type — where physically meaningful.
Column totals (= ∑ cols) sum across pressure types within one sector — a formal accounting sum; not physically meaningful given different units.
Use columns = ecosystem types receiving pressures (SEEA EA classification)
Grand ∑ supply = Grand ∑ use (accounting convention, not conservation law): the identity holds by construction, not from conservation of mass.
Pressure is not a physically conserved quantity. Preceded by Bogaart et al. (2023), Table 38.

Option D — Spatial Bridge Tables or Gridded Pressure Maps

D

Compilation pathway — not a standalone account design

Core idea

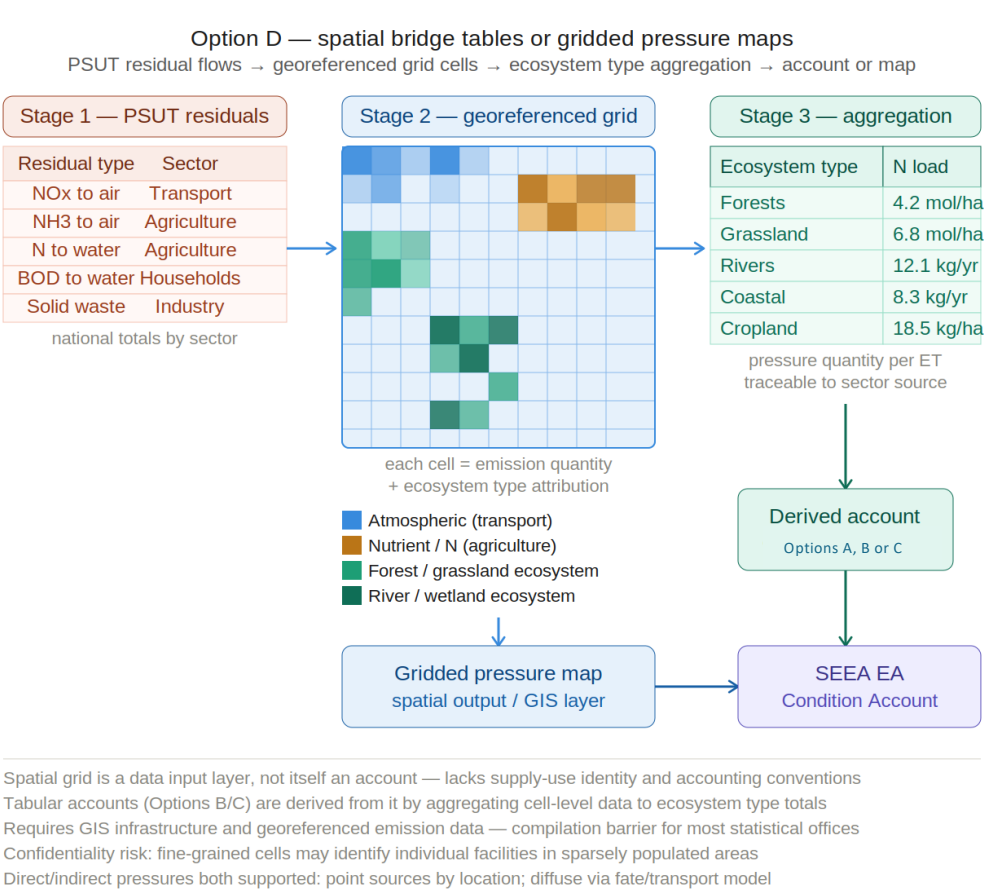
Georeferenced gridded data attributing emissions to ecosystem types by location. Not a tabular account. A spatial data infrastructure layer from which Options A, B, or C can be derived by aggregating cell-level data to ecosystem type totals.

✓ Strengths

Maximum flexibility — same data feeds multiple account designs. Directly aligned with SEEA EA spatial structure. Handles indirect pressures via transport model outputs. Aligns with GN A4 spatial accounts work.

✗ Key weaknesses

Not an account in the SEEA sense — no accounting identity. Most NSOs lack geospatial infrastructure needed. Scores N/A on accounting consistency (Table 1). Should be presented as a pathway, not an alternative to A/B/C.



Option E — Environmental Medium-Based Pressure Accounts

E

Compilation pathway — most accessible entry point

Core idea

Structured by environmental medium: Air Emissions Account extended with deposition loads by ecosystem type; Water Emission Account extended with nutrient loads by catchment; Land/Soil Account extended by ecosystem area. Each medium links to ecosystem types as a secondary step.

✓ Strengths

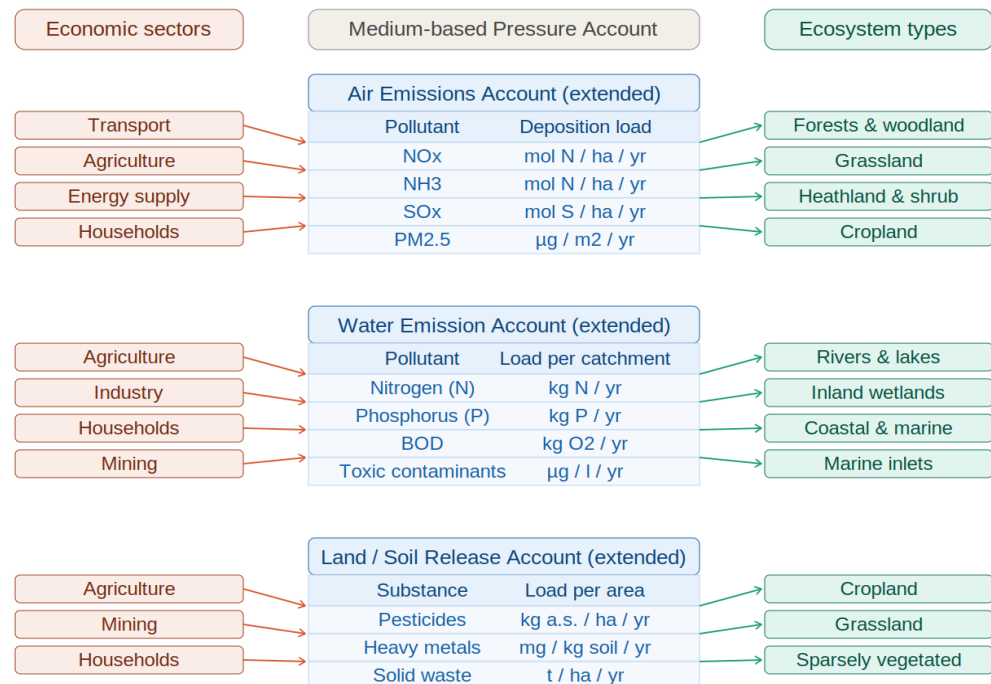
Most accessible entry point — natural extension of existing Air Emissions, Water, and Waste Accounts. Highest compilation feasibility of any option. Builds progressively on current practice. Medium maps onto transport pathways.

✗ Key weaknesses

Cannot show cumulative pressure on an ecosystem type across media without cross-referencing. Medium is an intermediate step — serves neither SEEA CF nor SEEA EA directly. Risks reinforcing emission = pressure confusion unless transformation is explicit.

Option E — environmental medium-based Pressure Accounts

Residuals organised by receiving medium · each medium links to ecosystem types as a secondary step



Three separate medium-based accounts — multi-medium integration (cumulative pressure on one ecosystem type) requires an additional step

Natural extension of existing Air Emissions Accounts and Water Accounts — highest compilation feasibility of any option

Risk: reinforces emission = pressure confusion unless transformation step (deposition / load modelling) is explicitly applied

Environmental medium is an intermediate step — not the primary object of interest for SEEA CF (sectors) or SEEA EA (ecosystems)

Option F — Ecosystem-Receiving Account

F SEEA EA-complementary — not a SEEA CF extension

Core idea

Inverts the organising logic. Starts from ecosystem types and asks what pressures each receives, from which sources. Ecosystem-centric rather than economy-centric. More naturally positioned as part of SEEA EA than SEEA CF.

✓ Strengths

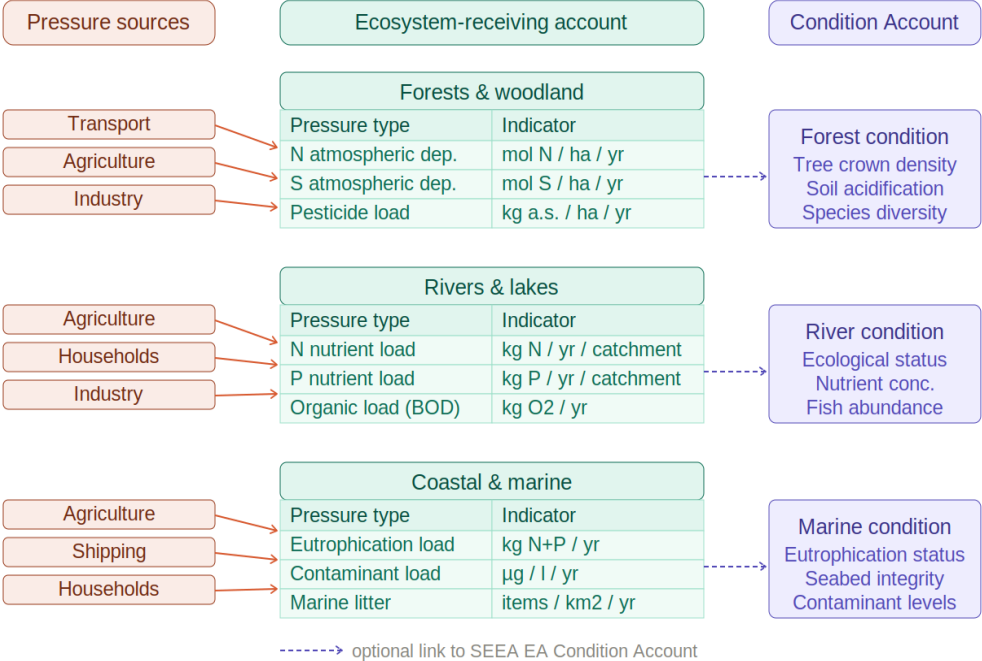
Intuitively aligned with ecosystem management perspective. Cleaner link to Condition Account. Confidentiality less acute — sources aggregated. Avoids supply–use balancing issues. Analogous to IPBES pressure typology.

✗ Key weaknesses

Weak connection to SEEA CF if source attribution absent — link to economic units in PSUT is lost. Requires full fate/transport modelling as precondition. Risks becoming Condition Account input rather than Pressure Account extending the CF.

Option F — ecosystem-receiving account

Ecosystem type as the organising unit · residual inflows recorded by source · optional link to Condition Account



Inverts the organising logic of Options A-E: starts from the ecosystem's perspective, not from the emitting sector
 Source attribution optional — where present, links back to PSUT; where absent, the account becomes EA-side only
 Requires fate and transport data to identify what each ecosystem actually receives, not just what sectors emit
 Statistical confidentiality less acute: aggregation by source category reduces facility identification risk
 Without sector source attribution, connection to SEEA CF is lost — account becomes a condition input table, not a CF extension

Option G — Modular Framework (Recommended)

G

Recommended framework — not a single account design

Core idea

Defines the conceptual architecture and presents Options A–F as compliant implementation patterns. Parallel to GN B1/B5 approach. Specifies minimum requirements; recommends Option B as baseline for comparability.

✓ Strengths

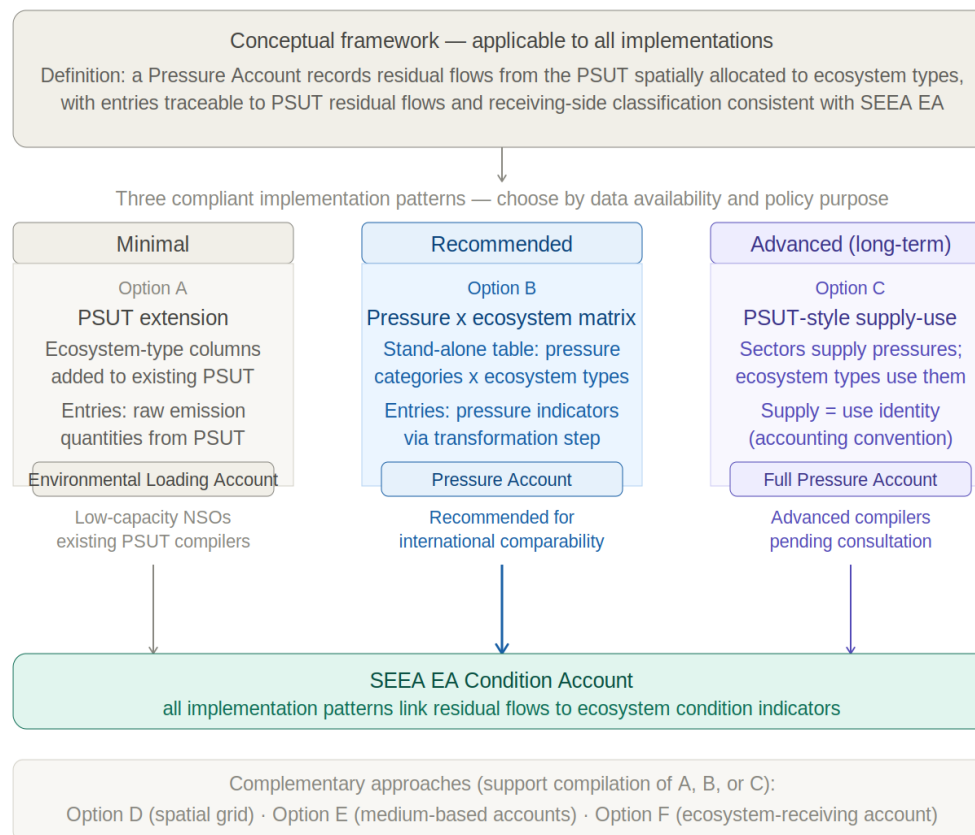
Highest adoption potential across NSO capacity levels. Avoids foreclosing innovation. Consistent with SEEA CF tradition of theoretical framework + implementable subsystems. Reduces global consultation deadlock risk.

✗ Key weaknesses

Risk of incoherence if all options treated as equally valid — cross-country comparisons become impossible. Requires explicit minimum requirements and a recommended baseline option. Modular label must not obscure the accounting character of the Pressure Account.

Option G — modular framework

A shared conceptual definition · multiple compliant implementation patterns · one recommended standard



Comparative Assessment of Options (Table 1 of GN B6)

Option	Accounting consistency	Bridge function	Compilation feasibility	Analytical clarity
A PSUT extension	High	Partial	Moderate	Low–Moderate
B Pressure × ecosystem matrix ★	Moderate	Moderate–High	Moderate	Moderate–High
C PSUT-style pressure account	Moderate ¹	High	Low–Moderate	High
D Spatial bridge / gridded map	N/A (pathway)	Moderate–High	Low	Moderate
E Medium-based accounts	Moderate ²	Low–Partial	High	Moderate
F Ecosystem-receiving account	Low	High (EA side)	Low–Moderate	High (EA users)
G Modular framework	Variable A–F	Variable	Variable	Variable

¹ Supply-use identity holds by convention, not conservation of mass. ² Depends on whether transformation step is carried out. D & E: compilation pathways, not standalone account designs.

Option G: The Modular Framework and the Recommendation

Option G defines the conceptual architecture and presents Options A–F as compliant implementation patterns — parallel to the GN B1/B5 approach for PSUTs.

Minimum requirements for any implementation to qualify as a Pressure Account:

- Traceable to PSUT residual flow data
- Identifies the receiving ecosystem type (classified consistently with SEEA EA)
- Documents any transformation steps between emission and pressure

The recommended modular framework positions each option as follows:

Option B ★

Recommended for immediate adoption

Stand-alone matrix; all residual types in one table; feasible with existing PSUT and spatial data.

Option C

Preferred long-term structure

PSUT-style supply-use account; pending resolution of transformation and additivity questions (Consultation Questions 3 & 4).

Option A

Minimal acceptable extension

For countries that prefer to remain within the PSUT framework; limited value without transformation step.

Option D & E

Compilation pathways

Spatial (D) and medium-based (E) pathways toward Options A, B, or C — not standalone account designs.

Option F

SEEA EA-complementary

Ecosystem-receiving perspective; more naturally part of SEEA EA than SEEA CF.

Block 4 — Recommendations, Global Consultation, and Research Agenda

Three Recommendations

1

Include a definition for a Pressure Account in the SEEA CF

Adopt the two-tier naming: Environmental Loading Account (spatially allocated PSUT flows, no transformation) and Pressure Account (flows transformed into ecological pressure indicators through a documented step). Both are valid implementations; the distinction must be stated explicitly. The transformation step sits outside the SEEA CF statistical accounting boundary and must be documented separately.

2

Adopt a modular framework for implementation

Option G with Option B as the recommended implementation for immediate adoption; Option C as the conceptually preferred long-term structure; Option A as the minimal acceptable extension. Options D and E are compilation pathways. Option F is SEEA EA-complementary. The modular framework must specify minimum requirements that any implementation must meet to qualify as a Pressure Account.

3

Submit key design questions to global consultation

Five questions are submitted (see next slide). These questions are of sufficient conceptual significance that they cannot be resolved unilaterally in the Guidance Note. Resolution will require empirical evidence from country pilots and expert consensus through the SEEA update consultation process.

Five Questions for Global Consultation

Q1

Transformation step and account naming

Should the Environmental Loading Account / Pressure Account distinction be adopted in the SEEA CF? Should the ELA be the primary standard, with the Pressure Account as an advanced option?

Q2

Classification unit on the receiving side

Record by ecosystem type (cross-country comparability) or by specific ecosystem asset (spatial precision, but statistical confidentiality risk)?

Q3

Supply-use identity in Option C

Option C imposes a supply = use identity on pressures, but pressure is not physically conserved the way mass is. Is this accounting convention sufficient justification for the structure, or does it create more confusion than clarity?

Q4

Additivity and composite pressure indices

Pressure Account rows are not additive across pressure types (different units, different ecological meanings). Formalise this as a defining feature, or permit composite indices with documented weighting assumptions?

Q5

Scope extension to natural input flows

Natural input flows (water abstraction, timber extraction, fish harvesting) also exert pressures and are recorded in the PSUT. SNA 2025 monetary depletion accounts add further argument. Should scope extend to include extraction-based pressures?

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