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System of Environmental Economic Accounting

Statistics Netherlands

1926 | 2026 Istat Istituto Nazionale di Statistica

# Advancing Connected Values of Ecosystem Services: Integrating Socio-Ecological Context and Economic Dependency

***Two complementary extensions to the Connected Values Framework***

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## 32nd Meeting of the UN London Group on Environmental-Economic Accounting

**September 2026**

Co-funded by the European Union. Eurostat grant 101262404, 2025-EE-SUSTAINABILITY.



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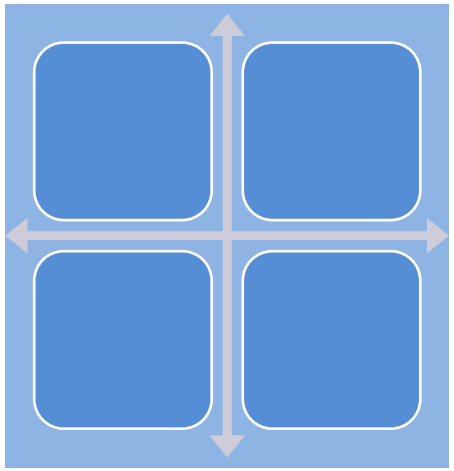
# Bringing together values from different perspectives

**Monetary values on ecosystems...**

...representing the whole range of actual transactions, embodied values, assets at risk, rents, opportunities…

…are allocated to the double-entry classification table of monetary values connected to ecosystem services



…based on the hypotheses on ecosystem service status (exist/does not exist) and human activities status that are embodied in the **scenarios** under which the values are computed

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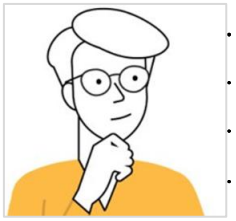
# Understanding the spectrum of connected values

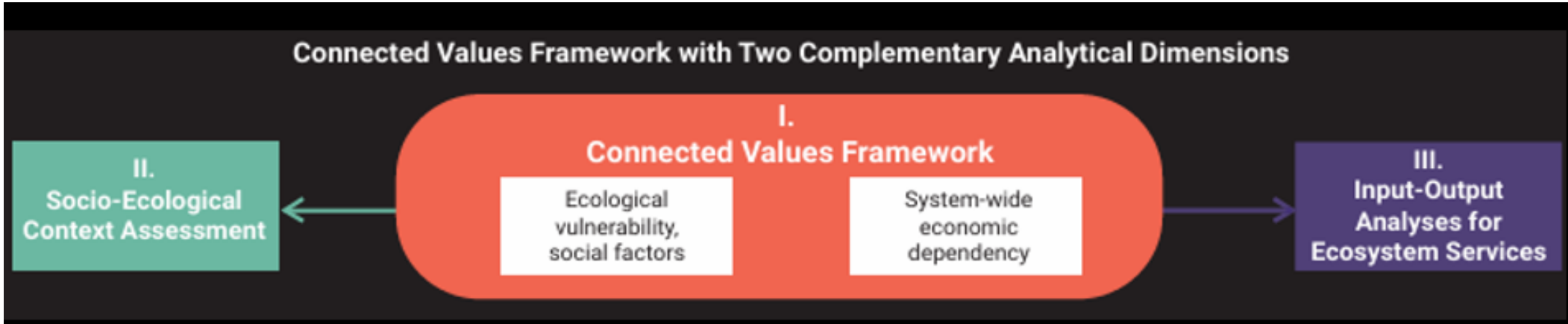
## REFERENCE SCHEME FOR THE CLASSIFICATION OF VALUES CONNECTED TO ECOSYSTEM SERVICES

ACCORDING TO THE FEATURES OF THE CALCULATION SCENARIO

| Connected monetary value in scenario | | Ecosystem service in scenario: ✓ Ecosystem service exists | Ecosystem service in scenario: ⊗ Hypothetical absence of the ecosystem service |
|---|---|---|---|
| **Monetary value exists** (scenario coincides with reality) | Ecosystem services (ES) are traded as private usage rights | Rent of the land, directly observable prices applied to actually traded volumes, observed value of actually observed transactions in tradable permits | × |
| | ES are potentially traded as private usage rights | Directly observable prices applied to tradeable rights to use the ES | |
| | ES are used for producing other goods or services | Resource rent, residual value, hedonic pricing | |
| | Other (outside or inside of SEEA-EA, within SEEA CF, other satellite accounts or SNA and their analytical extensions) | Subsidies, travel cost, effective carbon rates; Total value of goods and services and primary income whose production depends on the ES | |
| Monetary value "would appear" (does not exist in reality, does in the scenario) | Economic activity that avoids the need for the ES | | Abatement costs, averting behaviour |
| | Restoration of ES as economic activity | | Restoration costs |
| | Marketisation of the ES (with or without perfect price discrimination) | Prices applied to quantities of ES that are not actually under current institutional arrangements, WTP for maintaining ES | |
| **Monetary value "would disappear"** (exists in reality, is lost in the scenario) | Existing economic activities can no longer thrive, and/or assets are damaged («other negative changes in value») because of the lack of the ES | | Social cost of lacking ES, expected damages |



# Advancing connected values of ecosystem services: integrating socio-ecological context and economic dependency




**Why do we need context?**

Different connected values reflect different stages in socio-ecological pathways.

Their interpretation requires context:

| II. Socio-Ecological Context | III. Economic Dependency |
| --- | --- |
| Can the service continue to be supplied? How do ecological and social factors shape service realization? | Who depends on the service? How do dependencies propagate through value change and trade? |

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# Socio-ecological pathways to ecosystem service benefits

Different connected values reflect different stages in the pathways

**Ecological fundamentals**

extent, condition, thresholds, resilience, dependencies, risks

**Social fundamentals**

institutions regulating access, needs and preferences, economic structure, budget constraints

Ecological capacity

Actual demand

Realized ecosystem service flow

Societal or economic benefit

=> Not all connected monetary values represent benefits

=> Different connected values answer different policy questions.

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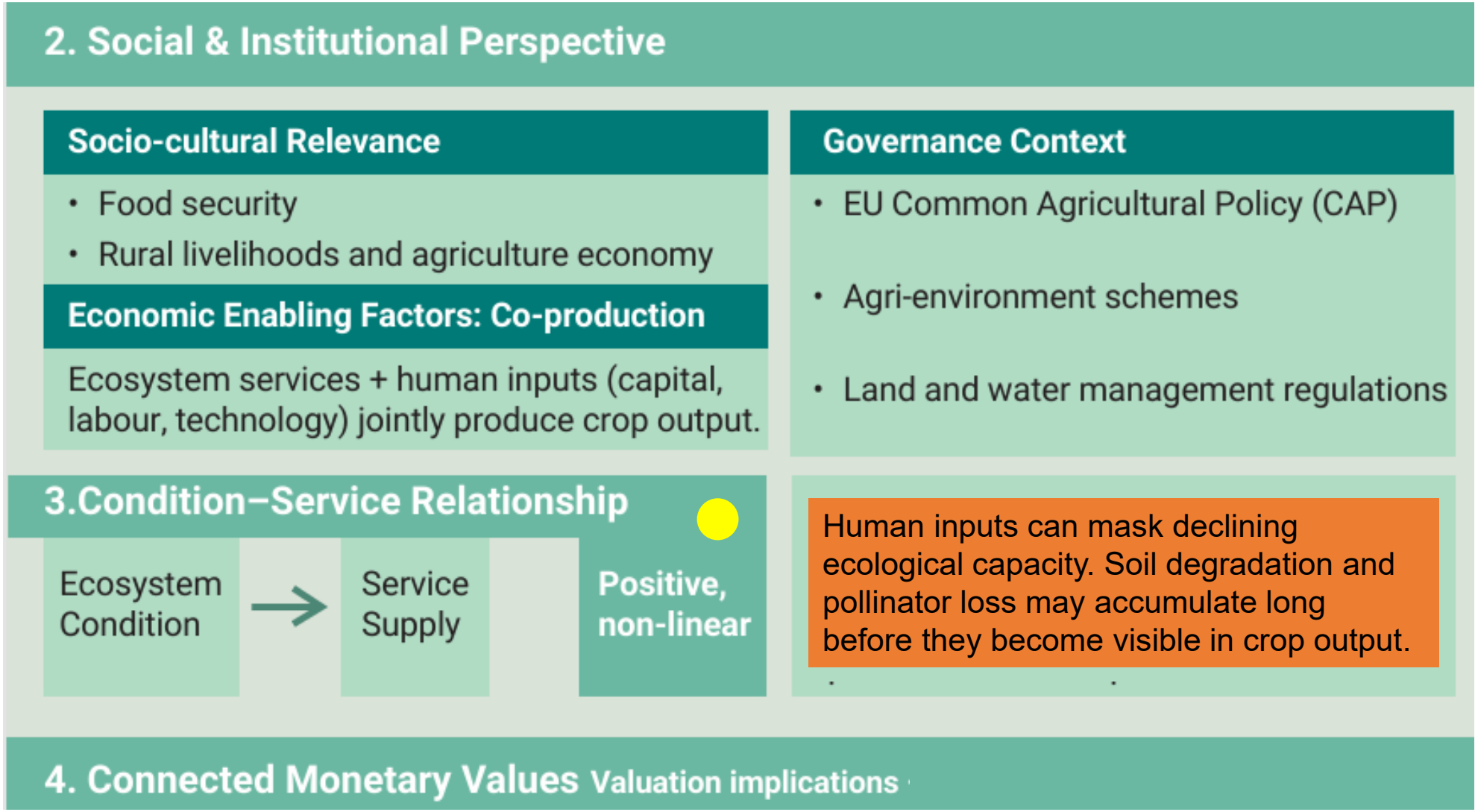
# Different ecosystem services require different interpretations

| Ecosystem service | Main ecological dependency/threat | Main social-institutional determinants of connected values | Condition–service relationship | Keywords on monetary values |
|---|---|---|---|---|
| **Crop provision** | Soil quality / land use practices | Agricultural policy / land ownership/food systems | Positive non-linear | Loss risk ≠ m-values / co-produced values / subsidies |
| **Wood provision** | Forest condition / disturbance | Forest governance | Positive non-linear | Market-oriented |
| **Crop pollination** | Pollinator habitats / habitat loss | Landscape-level coordination | Strong positive | Multiple values / partial coverage |
| **Global climate regulation** | Carbon stocks / land use practices | Climate policy | Threshold dependent | Non-equivalent values |
| **Local climate regulation** | Urban greenery / loss | Urban planning | Context dependent / insufficient evid | Partial coverage |
| **Air filtration** | Canopy cover / degradation | Territorial planning | Strong positive | Avoided damage |
| **Nature-based tourism** | Landscape quality / decline | Accessibility / tourism promotion | Positive context dependent | Partially captured |

# Crop provision: steady output may hide ecological decline



# Different connected values illuminate different parts of the socio-ecological system

| Rent value | Output value | Policy given value | Hypothetical value | Hypothetical value |
|---|---|---|---|---|
| **€113 M** | **€300 M** | **€174 M** | **€41 000 M** | **€1 M** |
| Rent price – most reliable anchor for pricing | Gross value of crop products | Agricultural subsidies attributable to food and feed production | Soil restoration cost – risk-of-loss signal | WTP for food security – welfare metric |
| Current economic benefit | Production outcome | Public priorities | Ecological vulnerability | Social welfare |

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Context helps explain what each value represents, why multiple values coexist, and which policy questions they answer.

# Extension 2: Who ultimately depends on ecosystem services?

Input-Output analyses: following the benefit and/or value beyond the first user

**Standard ecosystem accounts** identify who directly uses an ecosystem service.
Input-output analysis reveals who else depends on them.


**Input-output analysis reveals:**

- Who ultimately benefits from ecosystem services
- Which sectors indirectly depend on them

C. Rozendal, S. Schenau, „Structural analysis ecosystem accounting“ Report Eurostat Grant 2023, European Commission

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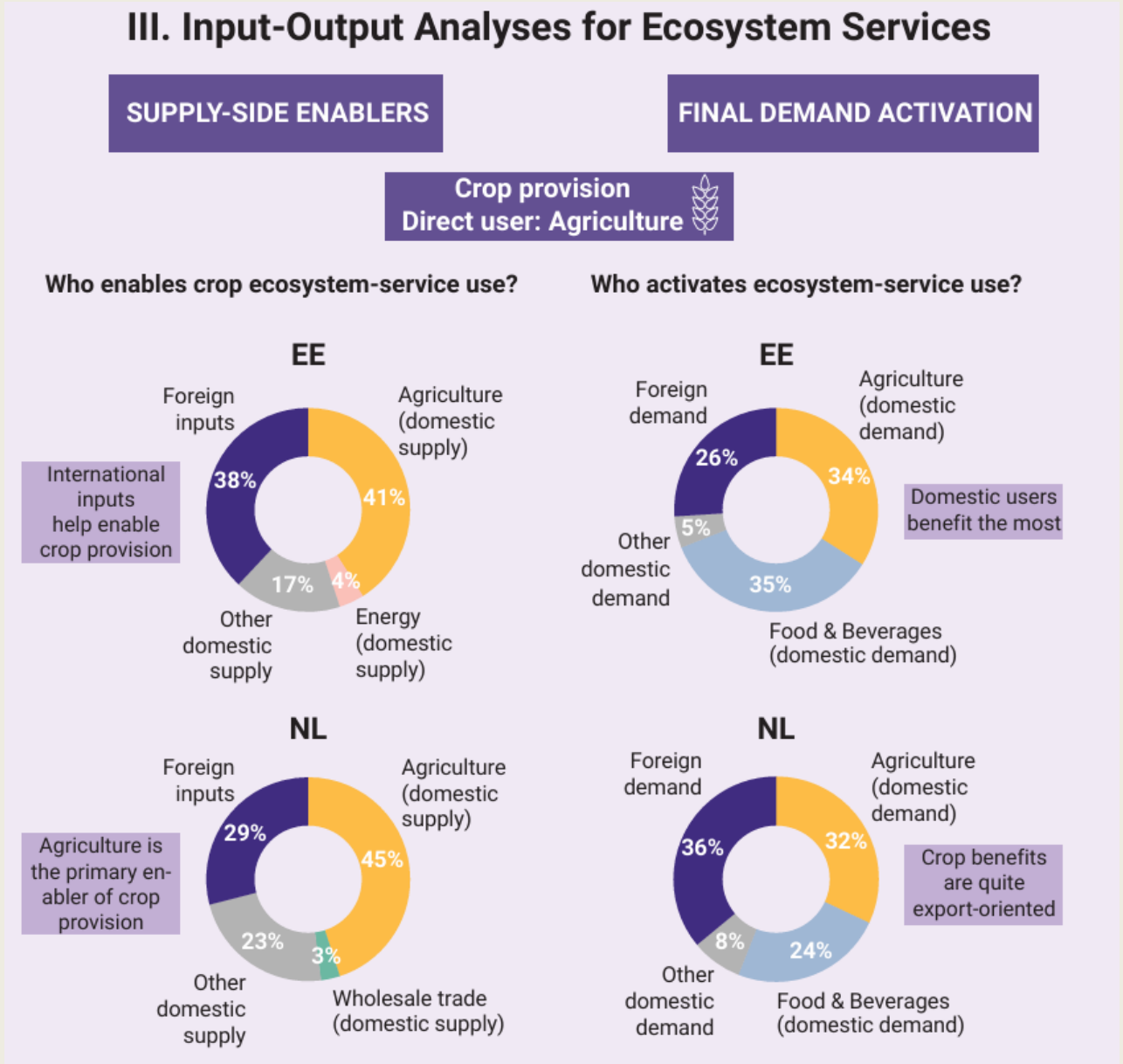
# Crop provision: from ecosystem service to food-system dependency




Supports entire food systems, not only farmers

Similar dependency structures in Estonia and the Netherlands

Ecological risks can affect the wider food system

Economic dependency on crop provision extends beyond agriculture into food production, trade and final consumption.

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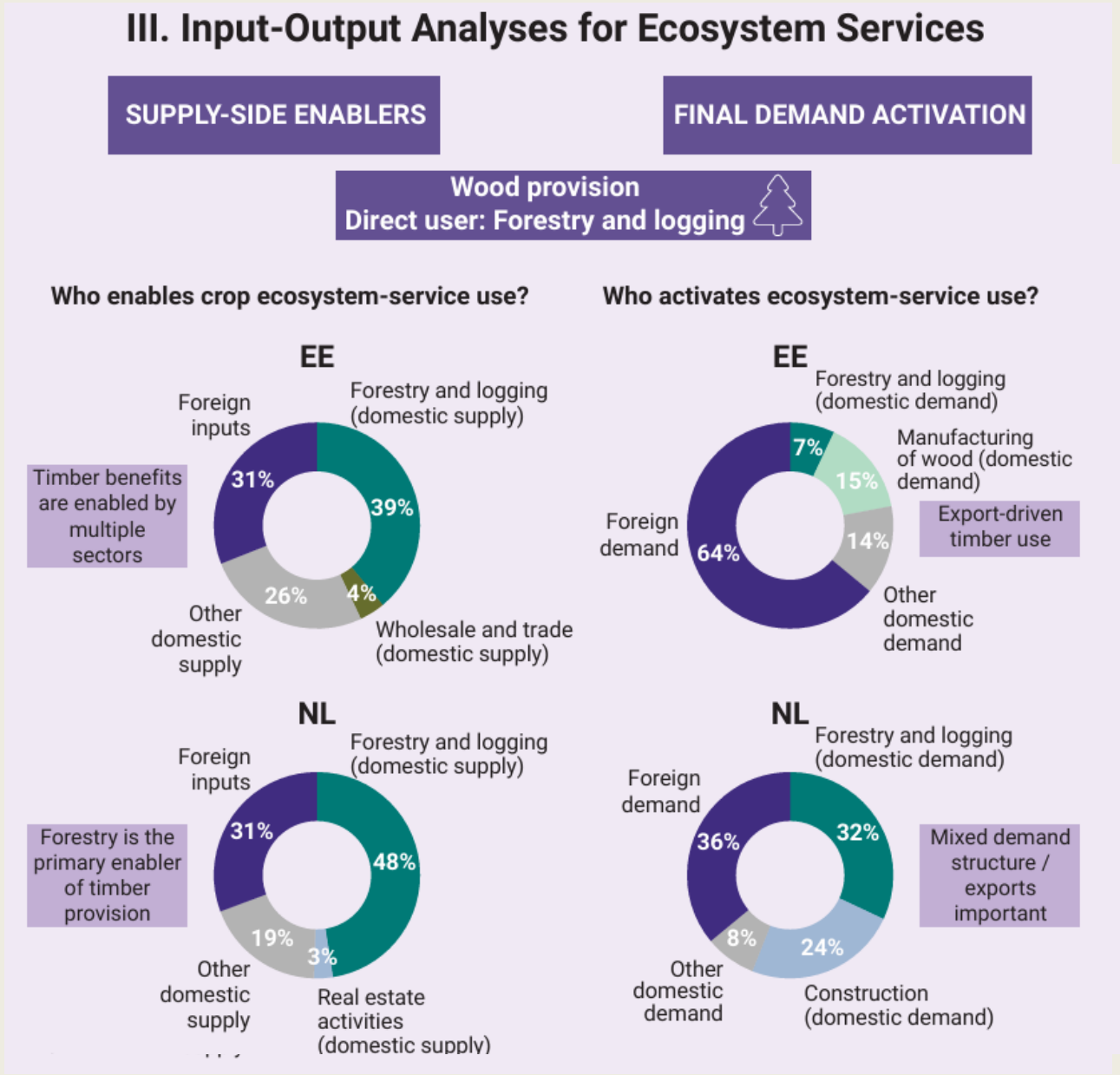
# Wood provision: from forests to value chains




Dependency structures differ markedly between Estonia and the Netherlands

Estonia: dependency extends into wood processing and exports

Netherlands: dependency remains concentrated around forestry

A substantial share of Estonian timber dependency is linked to foreign final demand. Economic significance depends not only on forest ecosystems, but also on value chains, exports and trade structures.

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# Synthesis combining socio-ecological context and economic dependency for crops and wood

| CROP PROVISION | WOOD PROVISION |
| --- | --- |
| **Hidden degradation + broad food-system dependency** | **Timber supply depends as much on governance as on ecology** |
| Productive capacity depends on soils, water regulation and biodiversity. | Forest condition determines long-term productive capacity. |
| Human inputs can temporarily mask declining ecosystem condition. | Realised supply is shaped by governance, ownership and competing forest functions |
| Benefits extend beyond agriculture into food manufacturing and final demand. | Estonia exhibits strong processing-chain and export dependencies. |
| Current market values do not reveal long-term ecological risks | A substantial share of timber-related dependency is linked to foreign final demand |

# Key messages for London Group

**1. Connected values require context**

Different values represent different stages of the pathway from ecological and social fundamentals to societal benefits and answer different policy questions.

**2. Socio-ecological context matters**

Ecological condition-service relationships differ across ecosystem services and influence how connected values should be interpreted.

**3. Economic dependency extends beyond direct users**

EEIOA reveals who ultimately benefits from ecosystem services and where ecosystem-service dependencies occur in the wider economy.

**4. Combining both improves interpretation**

Socio-ecological context explains whether services remain viable and how they are managed; dependency analysis shows where their benefits are ultimately used/enjoyed.

**London Group questions**

**How can SEEA EA better link condition, capacity and service flows?**

**How can SEEA EA capture economy-wide ecosystem dependence?**

**How can SEEA EA better recognise and interpret multiple connected values?**

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# Thank you!

*This work was supported by the Eurostat grant for environmental-economic accounting „Development of the environmental accounts 2025 – SUSTAINABILITY-EE“*
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