Valuation – Ecosystem Services

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13 February 2026

Agenda

- Introduction to valuation
- SEEA-EA valuation recommendations
- Valuation methods in practice
- Asset Valuation
- Ecosystem accounting for decision-making

Why is valuation important?

- To include nature with macro-economic decision making
- To derive indicators
- To underpin a wide range of sectoral policies

SEEA-EA and valuation

- SEEA-EA has been developed to provide information on valuation.
- It is aligned with the accounting principle of the System of National Accounts (SNA) 2008:
  - As a result, SEEA-EA uses exchange value as the principal valuation aim.
  - This allows the SEEA-EA values to be compared against the national accounts.

Recommended method: Exchange Value

- The value at which goods, services, labour or assets are exchanged for cash.
- Consistent with national accounts
- Aims to record transactions

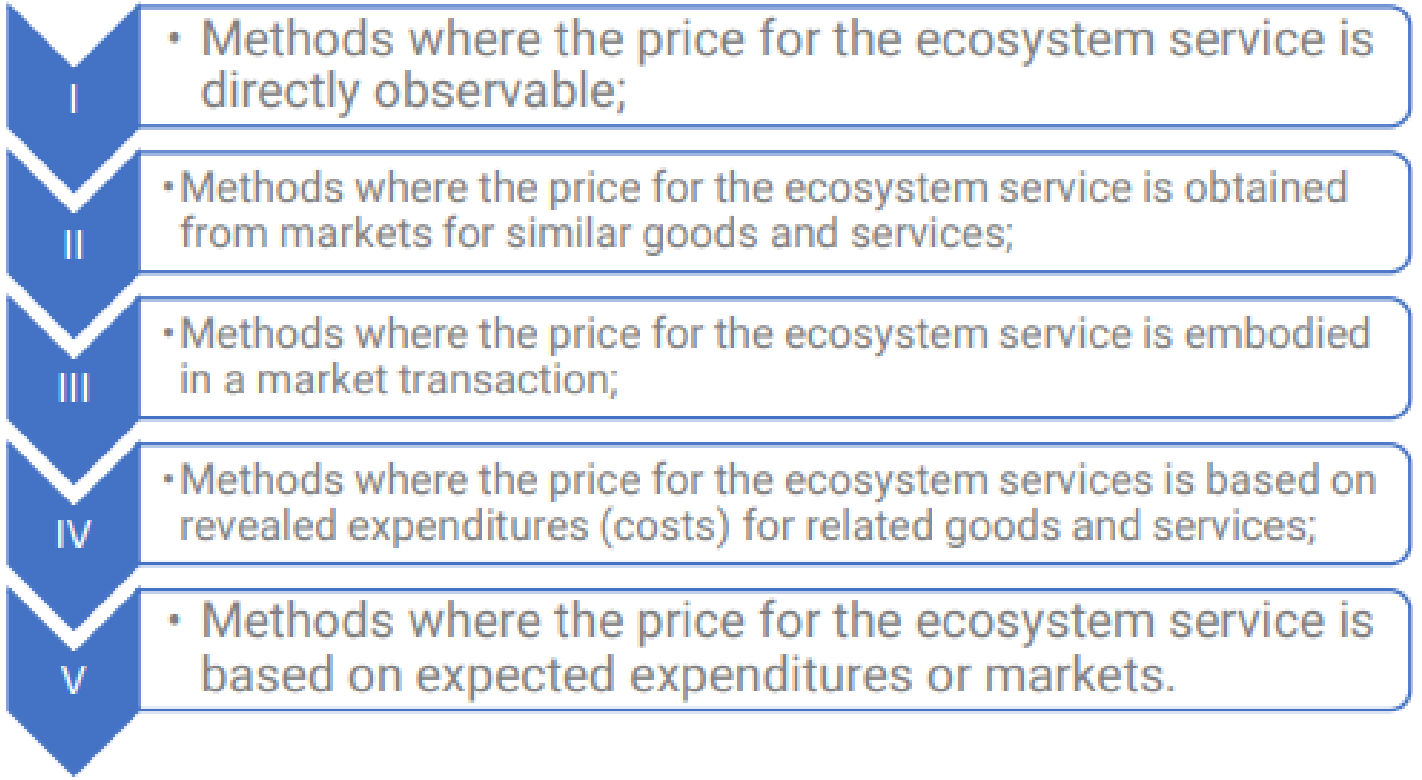
Why might this be difficult to capture?

- Not all ecosystem services are directly observable in economic transactions.
- They may be hidden within the transaction
- Or economic transactions may not capture the services ecosystem provide provide.

Valuation Methods

What valuation methods does SEEA-EA prefer?

Figure 2: *Preference order for valuing ecosystem services. Source: UN et al., 2021*



What are examples of these?

Table 1: Typology of valuation methods by SEEA EA preference order

SEEA EA order	SEEA EA Category of method	Methods	Alternative description / related methods	Conceptual basis
1	**Prices are directly observable**	Market prices	Gross revenue; public pricing; monetary incentives	Market price
2	**Prices from similar markets**	Similar markets		Market price (adjusted)
3	**Prices embodied in market transactions**	Residual value; resource rent	Net factor income	Revealed preference - direct
		Hedonic pricing		Revealed preference - indirect
		Productivity change	Production function method	Revealed preference - direct
4	**Prices from revealed expenditures on related goods and services**	Averting behaviour	Defensive expenditure; averting cost	Revealed preference - direct
		Travel expenditure	As revealed in: consumer expenditure method; zonal based models; random utility model studies	Revealed preference - indirect
5	**Prices from expected or simulated expenditures or expected markets**	Replacement cost	Substitute cost; alternative cost	Revealed preference - direct
		Avoided damage cost	Cost of illness; human capital	Revealed preference - direct
		Simulated exchange value		Modelling

Why might you want to use one over the other?

- The characterises of an ecosystem may mean one method is more appropriate than another.
- Where are the prices available?
  - Observable or hidden?
- The type of market:
  - Is it a free market or controlled?
- Data availability:
  - What type of data is available?

Looking at individual methods

Market Prices

- This approach uses direct market prices to value the service – *the amount of money that willing buyers pay to acquire something from willing sellers*
- For example, in the UK:
  - We use the stumpage price of wood to estimate the value of timber provisioning. Capturing the value buyers are willing to pay for wood.

Limitations with the market prices approach

- However, for some ecosystem services we can find information about market prices… the issue is identifying how much of this is the contribution of the ecosystem service.
- For some regulating services, there is not a market price available.

Residual Rent/Resource rent

- Aim: to identify the values provided by ecosystems that are hidden in market values. In this approach, the cost of the inputs are subtracted from outputs – the leftover value is the service of the ecosystem.
- Commonly used at a broad industry level
- Resource Rent – commonly used in ONS's Natural Capital Accounts for provisioning services

Box 2: *Resource rent*

Output

- intermediate consumption

- compensation of employees

- other taxes on production

+ other subsidies on production

= gross operating surplus

- consumption of fixed capital (depreciation)

- return on produced assets

- labour of self-employed persons

= resource rent

= depletion + net return on environmental assets

Source: SEEA Central Framework; UN et al. 2012, p.153)

Resource Rent in practice in UK

- $\text{Annual Value} = \text{G.O.S.} + \text{Taxes} - \text{Subsidies}$
  $- \text{Depreciation}$
  $- \text{Return to Produced Assets}$
- "G.O.S." = Gross Operating Surplus
- Data is sourced from the UK national accounts
- We use industry wide breakdowns – for example, using the Water supply industry as a proxy for water provisioning

Positives & Limitations

- Positives:
  - Can be completed with industry data from the national accounts
  - Based on observed data
- Limitations:
  - Often used at a broad industry-level, so are dependent on services included within the industry.
    - Can also limit granular estimates
  - Are there any non-paid and indirect inputs?
  - Subject to variations in the market

Hedonics Pricing

- A premium on a value derived from proximity to an environmental attribute.
- To measure this effect, all other characteristics of the property need to be included.
- We use this for Recreation and Aesthetic – an ecosystem service measuring the effect of green and blue spaces on house prices.
- Requires many different data sources.

Travel Cost

- Used to estimate the value of recreational areas based on the revealed preferences of visitors to a single site.
- Need to find the exchange value to access these sites.
- Surveys of people visiting nature or recreation can be used

Other valuation techniques

Replacement cost method

- Estimate the cost of replacing an ecosystem service by a substitute that provides the same contribution to benefits.
- Depends on:
  - Substitute can perform the exact same function as the ecosystem service
  - There would be a willingness to pay for the substitute if the ecosystem were no longer provided.

Avoid damage method

- Estimates the value of ecosystem services based on the costs of the damages that would occur due to loss of those services.
- Could be suitable for items like flood control, soil erosion control.
- Aim to identify economic unit who would benefit from this service and estimate impact of the damage of the ecosystem services.

How might these different ecosystem services be measured?

- Wood provisioning
- Water Provisioning
- Tourism/Recreation

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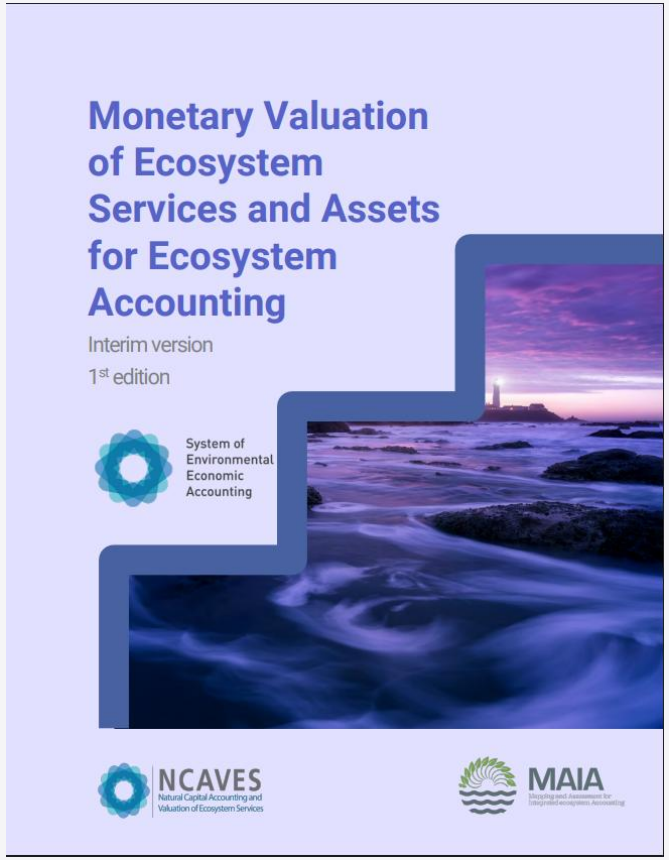
What to consider when selecting a technique?

Guidance available

- Different valuation methods may be preferable for each ecosystem service
- Guidance for each ecosystem available



Example of tiers for different services

Table 5: *Tiers of primary valuation methods for ecosystem services*

ECOSYSTEM SERVICE		Tier 3	Tier 2	Tier 1
Provisioning services				
Biomass provisioning services	Crop provisioning services	Land rental values Productivity change method	Residual value (spatial)	Residual value
	Grazed biomass provisioning services	Land rental values	Replacement cost Residual value (spatial)	Residual value
	Livestock provisioning services	Productivity change method	Replacement cost	Residual value
	Aquaculture provisioning services	Productivity change method		Residual value
	Wood provisioning services	Directly observed prices (stumpage values) Land rental values		Residual value
	Wild fish and other natural aquatic biomass provisioning services	Directly observed prices (traded quota prices) Productivity change method		Residual value
	Wild animals, plants and other biomass provisioning services		Similar markets	Residual value
Water supply		Directly observed prices (water rights) Productivity change method	Replacement costs	Residual value
Regulating and maintenance services				
Global climate regulation services	Sequestration component	Directly observed prices (emission trading schemes) – high spatial detail		Directly observed prices (emission trading schemes) – no spatial detail
	Retention component	Social cost of carbon (bespoke model)		Social cost of carbon (literature)
Local (micro and meso) climate regulation services		Productivity change	Averting behaviour	Avoided damages Replacement costs
Air filtration services		Avoided damages		Averting behaviour
Soil and sediment retention services	Soil erosion control services	Productivity change	Replacement cost Avoided damages	
Water purification services (water quality regulation)	Retention and breakdown of nutrients	Directly observed prices	Replacement costs Avoided damages	

How might different valuations techniques impact results?

- Each valuation technique is measuring something different – they have a particular focus.
- For example, for Water provisioning:
  - Residual price has a focus on the industry
  - Replacement cost is a value if it didn’t exist.
  - Water rights is a cost of using water

Constant Prices

- SEEA-EA recommends keeping prices constant.
- This means using a deflator to remove the changes in prices over time.
- The choice of deflator can change the trend, even if the valuation technique stays the same.

Advice: things to think about

- What service are you aiming to measure?
- where would the exchange value come from?
- What data do you have available to use?

Asset Valuation

What is Asset Valuation

- In the SNA, assets are entities that must owned and from which economic benefits are derived by their owner by holding them over time.
- SEEA-EA extends to include physical environmental and non-market ecosystem services.
- Provides the value of the benefits that these ecosystem services provide over their lifetime.

Net Present Value

- The recommended approach by SEEA-EA
  - The stream of services that are expected to be generated over the life of the asset and then discounted back to the present accounting period.
- To calculate it, we need:
  - A discount rate
  - Expected asset life
  - Future use of the asset

Asset Lifetime

- Asset lifetime is the period over which the services from a natural resource or habitat are expected to be supplied.
  - This might different be different for renewable versus non-renewable life.
- You may wish to identify specific values for an asset or take a standard approach

Discount Rate

- Required to compare income and costs at different points in time. They express how much future earnings are worth today.
- Discount future values in terms of current prices.
- For example, If I were to receive $1 in one year's time, and I had a discount rate of 5%, the present value of receiving $1 in a year's time is $0.95

Using discount rates

- Higher discount rates mean future values are worth less today than lower discount rates
- Many ecosystem assets generate returns over a very long period, so lower ones maybe more applicable.
- Discount rates is applied over the asset lifetime:

Projecting future ecosystem flows

- Estimate the value of future ecosystem services.
- To answer: how could the demand of services of the ecosystem change and the evolution of supply change over time?
- Could it increase with population change? Or change with climate change? Or will demand change? Or stay the same?

In the UK

- We use discount rates provided by the UK government in Green Book.
- For renewable assets, we use an asset time of 100 years, non-renewable asset are 25 years:
  - 25 years is based on World Bank's report
  - 100 years captures over 90% of the NPV based on infinite flows
- Projected future flows depend on the ecosystem service

Future flow examples

- Timber provisioning:
  - We use timber projections data
- Greenhouse Gas regulating:
  - We use projections of carbon emissions
- Recreation and Tourism Cultural Service:
  - We use population projections

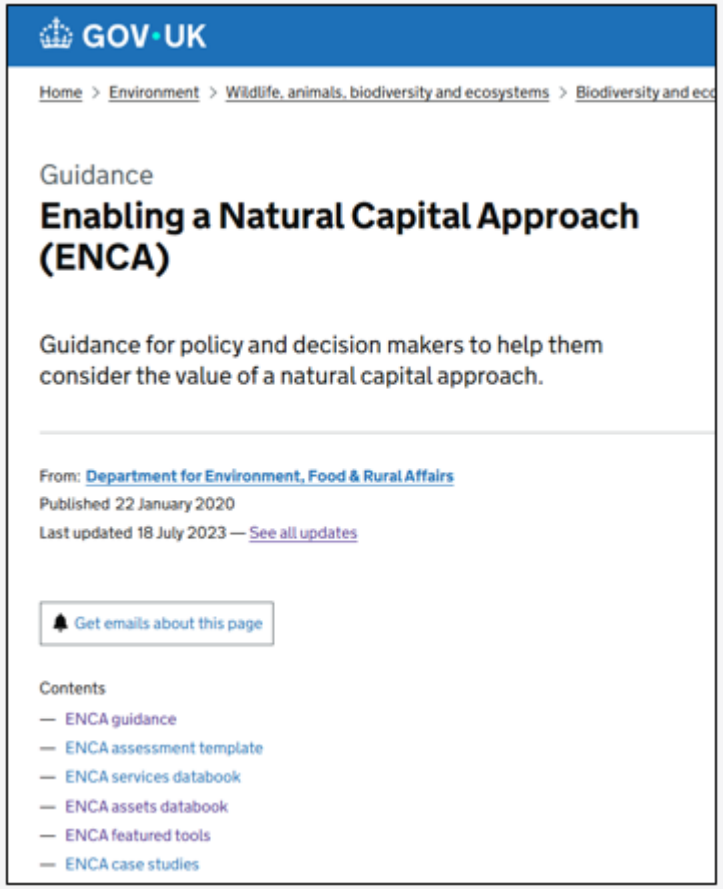
Asset Value Calculation

- Asset Value today=
  + Benefit in year 1 (adjusted to today)
  + Benefit in year 2 (adjusted to today)
  + benefit in year 3 (adjusted to today)
  + …
  + benefit in year N (adjusted to today)

Use for decision making

The UK's natural capital accounts in decision making

- Providing evidence to use in policy development and appraisal
- see Defra's Enabling a Natural Capital Approach (ENCA) guidance and evidence databooks
- Insights from Natural Capital Accounts - giving the big picture



Any questions?