Department for Environment Food & Rural Affairs

SEEA Experimental Ecosystem Accounts

Valuation

EEA training webinar

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1. Why do valuation?

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Why value ecosystem services?

- ***Nature is priceless; but different ecosystem services (nature's contributions to people) have different values and it can be helpful to understand the relativities (and hence trade-offs) in monetary terms***
- Monetary valuation provides a common metric through which services can be aggregated and compared within and across ecosystems, as well as with the National Accounts
- ***GDP on its own only tells us part of the story. Within the accounting framework we can combine economic data with information about the value of services provided by ecosystems***
- Monetary values have resonance with a broad range of stakeholders. In particular, it is the language of the Finance Department
- ***Beyond accounting, environmental valuation is widely used in cost-benefit analysis***
- Hence it is essential that the purpose of valuation is understood: different valuation approaches have a different conceptual basis and can give significantly different values

General strengths and uses of valuation

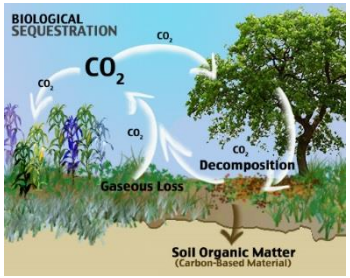
1) **Recognising value.** Quantified, tangible, objective and uniform nature (even if the underlying assumptions may be questioned). Helps communicate the significance and magnitude of environmental impacts, and the value of nature to people; it gets decision-makers thinking about the value of nature

2) **Demonstrating value.** Not valuing non-market goods and services risks positive and negative environmental impacts getting ignored in decision-making, resulting in losses to economic welfare and wellbeing. Through cost-benefit analysis, valuation enables more effects of an intervention to be assessed, and trade-offs highlighted

3) **Realising value.** Informing the design of economic instruments e.g. the setting of entry fees, user charges, taxes, payments for ecosystem services. Can inform legal damage assessments

Valuation in natural capital accounts directly supports (1) and potentially supports (2)

Benefits of valuation – communication/avoiding bad decisions



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+

= 10 x

What we don't want valuation to tell us ....

Flow
GDP ⬆

Stock
Wealth ⬇

What we do want ecosystem service valuation to do ..

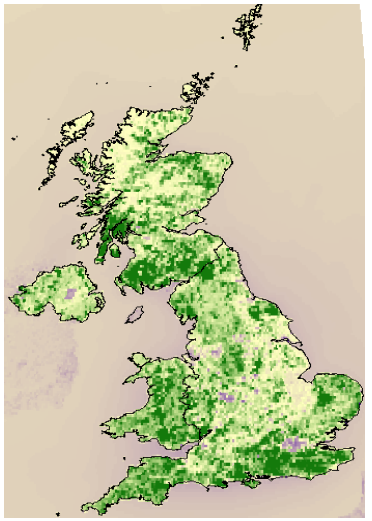
Be part of a wider monitoring system which informs about the state of our natural capital – a focus on flows as well as stocks

Give a sense of the relative importance of different services – hence the need for a common, well-accepted metric

Be able to track changes in volume as well as monetary values – understanding the reasons for changes in the values of services is vitally important

Have the potential to be disaggregated spatially

Act as a base for scenario development/projections of future flows



Where are the PM2.5 particles being removed?

There are two types of valuation in natural capital accounting

1. Valuing actual flow of services

- Valuation of services based on physical flows
- Many different methods used. Aim is to identify and value the contribution of the ecosystem

2. Valuing ecosystem assets

- Asset values are capital values (e.g. a house, a company share, a football player transfer) – reflect stream of expected benefits
- Based on projecting services over its lifetime (>100 years?) and discounting to a “net present value” i.e. a capitalised value.

Valuation provides a common metric through which services can be aggregated and compared within and across habitats

It enables comparisons with the flows and stocks that are already included in the System of National Accounts.

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2. Valuation within the SEEA EEA framework

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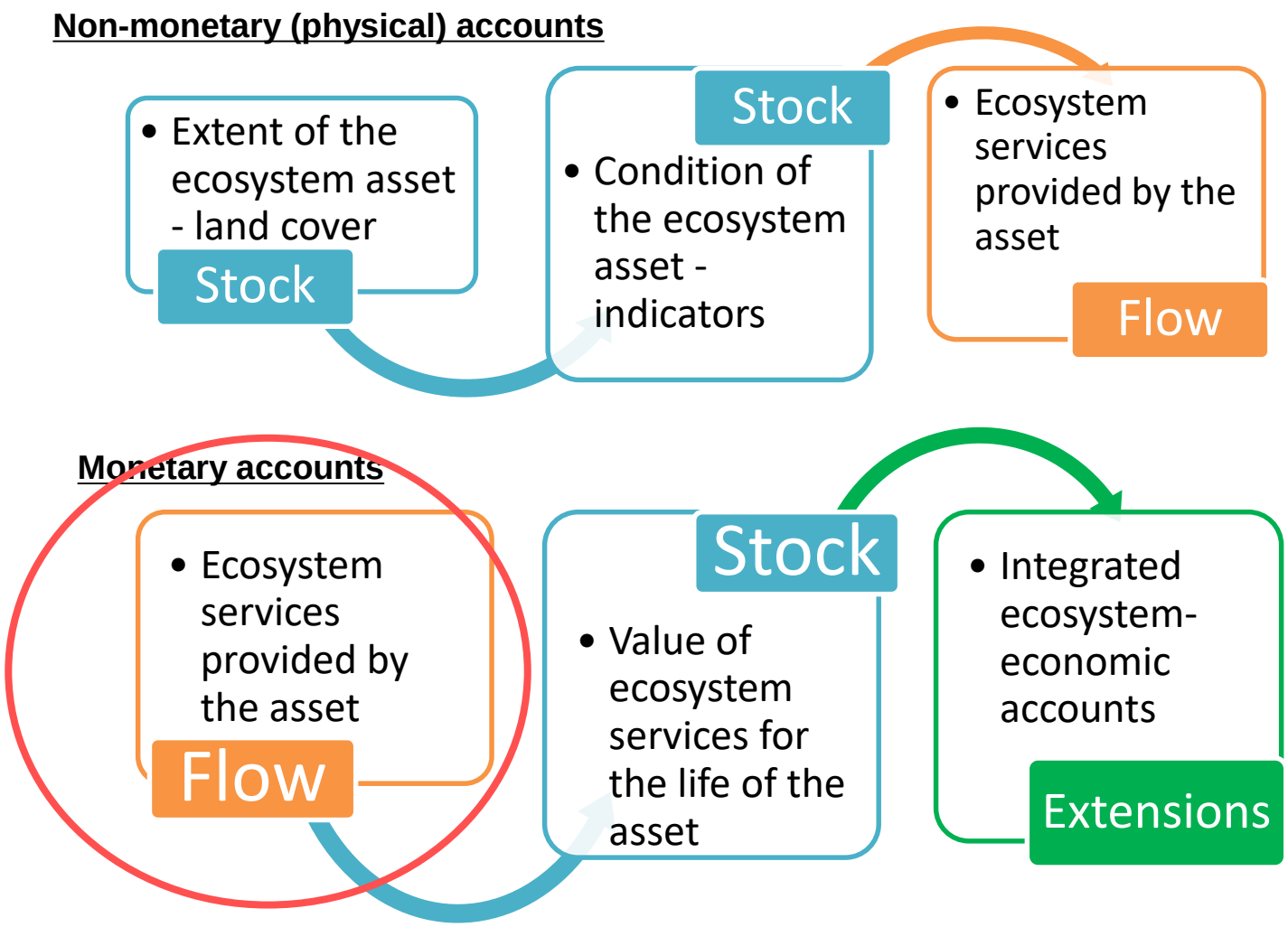
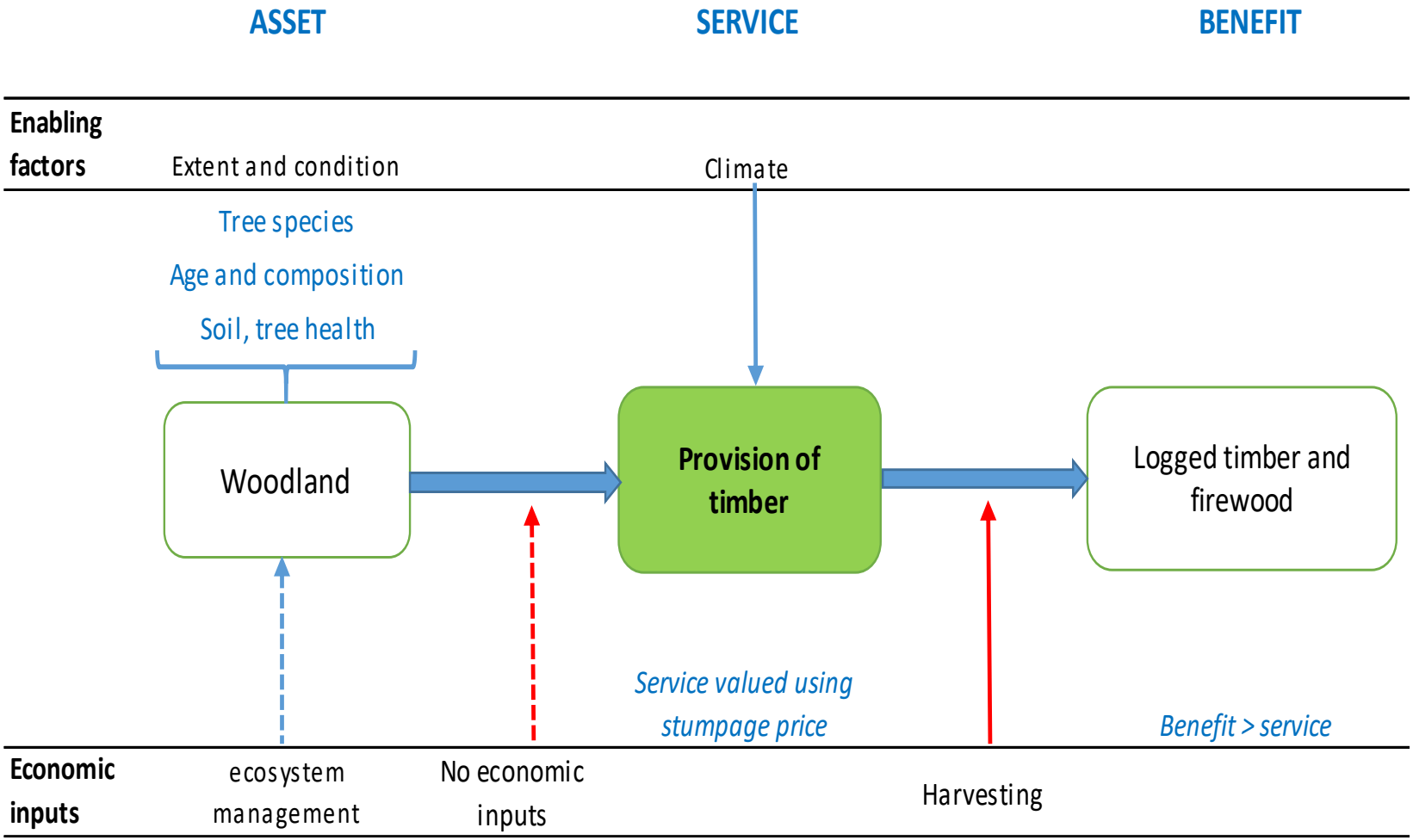
Where does ecosystem service valuation fit in the SEEA?



Logic chains help to clarify relationships between accounting entities



- *Not an ecological production function necessarily. Helpful to distinguish between service and benefit – then identify the ES contribution to the benefit. May also help with issues about the nature of the counterfactuals.*

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3. Different valuation approaches

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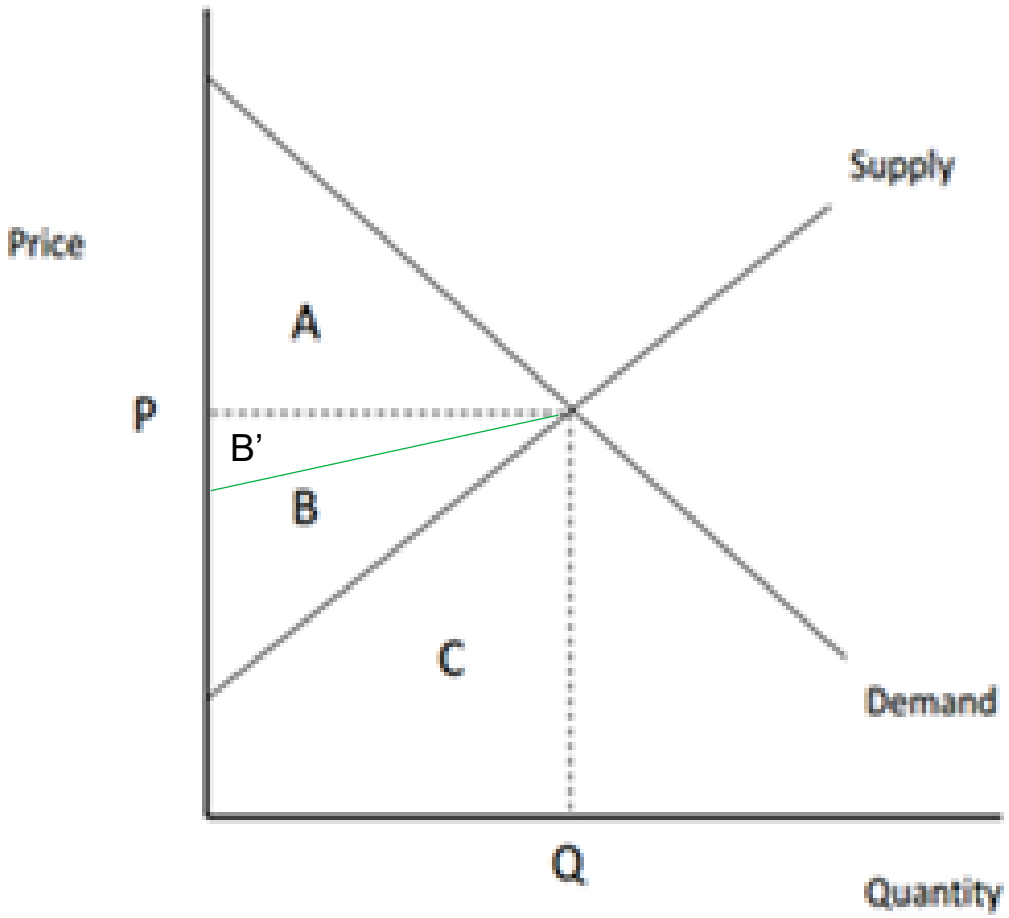
What is environmental valuation?

- Market prices for goods and services reflect the interplay of supply and demand and indicate the economic value that society places on those goods and services
- But many environmental goods and services that give value to society are not typically, or directly, traded in markets

  e.g. recreation, pollination, carbon sequestration, clean water
- Environmental valuation = the attempt to estimate in monetary terms **the value to society** of the level, or changes in, these goods and services
- It is recognised that “Value” has different meanings in different contexts as defined by different disciplines
- We tend to use the term price as a short hand for values per unit of supply. However

*** ECONOMIC VALUES ARE NOT THE SAME AS PRICES ***

Exchange, resource rents and welfare values



A = “consumer surplus”

B = “producer surplus”

B’ = ecosystem contribution to producer surplus

C = total variable cost

Revenue = P x Q = B + C

A range of techniques are available – but no firm guidance yet established

- **Market-based methods –** where environmental goods and services directly contribute to marketed production e.g. farm produce, timber
  - Resource rents
  - Production function approaches
  - Payments for ecosystem services
- **Revealed preference and inferred value methods** – inferring environmental values from observed choices by beneficiaries in actual markets such as property, recreational travel, water-related goods
  - Hedonic pricing
  - Replacement costs
  - Damage costs
  - Travel costs
- **Stated preference methods** – inferring environmental values from carefully designed questionnaires that involve trade-offs between money and environmental goods. Can capture wider range of values including non-use values, but can be subject to biases

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4. Worked examples

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Example: valuing woodland timber provisioning service (annual)

Physical service flow

- Volume of timber removed

→ 13.7 million cubic metres of wood standing (overbark)

Valuing the flow

- Use market prices such as stumpage prices:
- £16.58 per cubic metre of overbark standing in 2015

The stumpage price represents the value of the timber standing in the forest (i.e. before extraction). It may be necessary to net off some management overheads

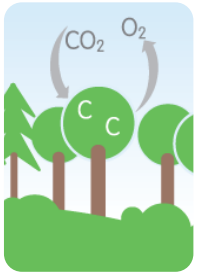
P x Q: Value of ecosystem provision of timber

= 16.58 x 13.7

= £227 million p.a.

NB This treatment assumes that cultivated timber in plantations is not included in the accounting framework in the form of incremental growth

Example: valuing woodland's carbon sequestration service (annual)



Physical service flow

- UK woodland area
- Data on age, species, etc
- Apply sequestration rate / ha

→ 17 million tonnes of CO_2 equiv. removed

Valuing the flow

- Use appropriate carbon price e.g. non-traded price of carbon (consistent with meeting UK targets)
- The extent to which this is an exchange value depends upon assumptions about the nature of the market that would have to be in place in order to obtain such prices
- £61/tonne in 2015

P x Q: Value of ecosystem contribution to the sequestration of carbon

= £61 x 17

= £1,046 million p.a.

Example - valuing woodland recreation

Physical service flow

- Numbers of visitors to woodland (based on survey data)

→ 557 million visits in 2015

296 million hours spent

Valuing the flow

- Travel cost method: using combination of costs of travel and admission to sites
- Average cost per visit £0.52

Excludes value of time, so free trips are not given a value
Requires assumptions about primary and secondary destinations/purposes

P x Q: value of recreational services provided by woodland

= £0.52 x 557

= £291 million p.a.

Example: valuing air pollutant removal

Physical service flow

- Uses sophisticated atmospheric chemistry model
- This accounts for transport and deposition of pollutants, variations in meteorology and summer/winter leaf cover, and interactions within the atmosphere and between different pollutants
- The role of vegetation (natural capital) is assessed by modelling two scenarios for pollutant concentrations: one with and one without vegetation
- For $PM_{2.5}$, the average population weighted concentration (for an English municipal area) was

  - 4.85 ug/m3 with vegetation
  - 5.75 ug/m3 without vegetation

Valuing the flow

- This service provides a health benefit through the reduced exposure of the receiving population
- Can use official air quality impact pathway guidance – e.g. for $PM_{2.5}$, an established health-response function of 0.0011 ug/m3
- Value can be based on reduced respiratory hospital admissions from an established baseline

Baseline hospital admissions (for an English municipal area)	1,551
Health-response function	0.0011
Value per hospital admission	£6,650

Value of air pollutants removed by vegetation (for English municipal area) = (6,550 x 0.0011 x 1,551) x (5.75-4.85) = £10,211

NB vegetation outside the area is responsible for reducing concentrations within the area

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5. Some UK results

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Accounting values highlight the importance of natural green spaces in urban areas

Significant policy relevance

- 80% of population
- Concern over greenspace, loss of parks etc
- Links to health and well-being
- Cities interested e.g. London, Manchester, Sheffield

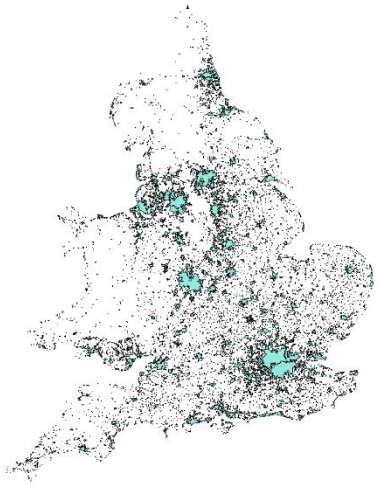
House of Commons
Communities and Local Government Committee

Public parks

Seventh Report of Session 2016–17

Key issues in valuing ecosystem services in urban areas

- Clear physical and mental health benefits but not always clear what the counterfactual should be
- Key services are recreation, air filtration, noise, local climate regulation, amenity



Illustrative urban ecosystem service values (UK, 2015)

Service	Value £m	Type of valuation
Food – urban farms	13	Exchange
Food – allotments	11	Exchange (net of costs)
Pollination	?	Replacement cost?
Public water supply	59	Exchange
Carbon sequestration	78	Between exchange and welfare
Flood protection	?	Avoided damage?
Air filtration	222	Between exchange and welfare
Local climate regulation – vegetation	166	Exchange
Local climate regulation – shade	?	Welfare
Noise mitigation	14	Welfare
Nature based recreation – travel costs	2,100	Exchange
Nature based recreation – free trips	3,700	Welfare
Education	1	Exchange?
Physical health	4,400	Welfare
Amenity	6,500	Exchange (double counts some of the above)

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6. Some final thoughts

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Accounting for asset maintenance costs and the costs of restoring degraded assets

- Maintenance costs do not provide a direct estimate of the value of an asset or its services but are important from a policy viewpoint
- Can be incorporated as extensions to the main accounts
- Important elements of sub-national/corporate accounting approaches
- Useful to compare the cost of restoration with the values of the services provided by the ecosystem

Limits to valuation in accounting

‼ We can't assign values to all the benefits we get from natural capital

- Many cultural services and in particular those that relate to future generations are difficult if not impossible to value
- Natural assets are interrelated and complex, subject to biophysical uncertainties (e.g. flood regulation), spatial variations (e.g. recreation, air filtration), environmental limits and thresholds

So the representation of natural capital in monetary accounts will only ever be partial. Valuation is still a developing science / art

‼ Valuation techniques are often not precise and often provide only "single point estimates". Estimates should be seen as indicative, subject to uncertainty and revision (especially in the early phases of developing accounts)

‼ Attempts to value nature can be misunderstood or presented as "privatizing nature"

‼ Valuation needs to be considered alongside other biophysical information about the assets. Estimates of future service flows need to reflect the current physical condition of an asset, but this relationship is often not fully understood

‼ It is not yet clear how far accounting values can be used in cost-benefit analyses - or vice versa

Questions?