Defining exchange and welfare values, articulating institutional arrangements and establishing the valuation context for ecosystem accounting

Discussion paper 5.1

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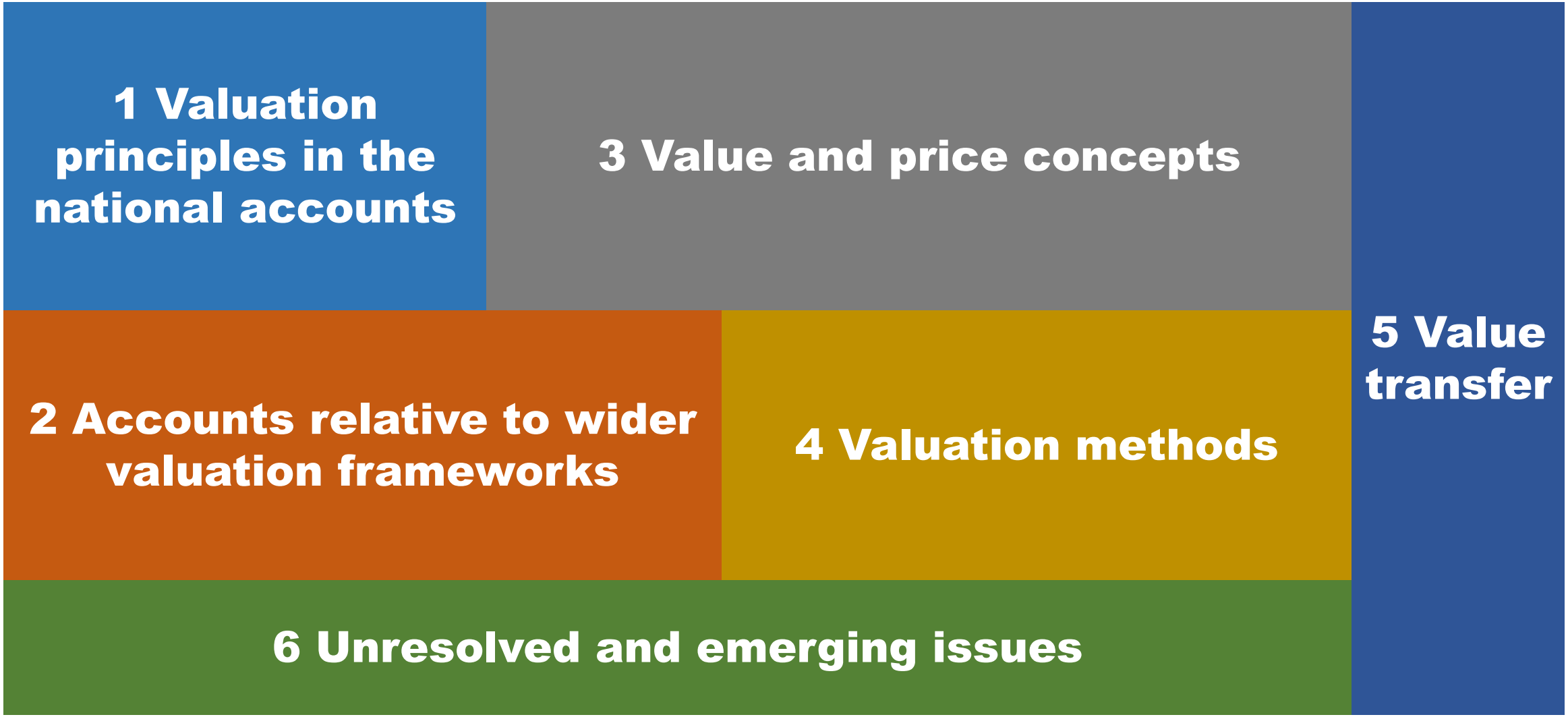
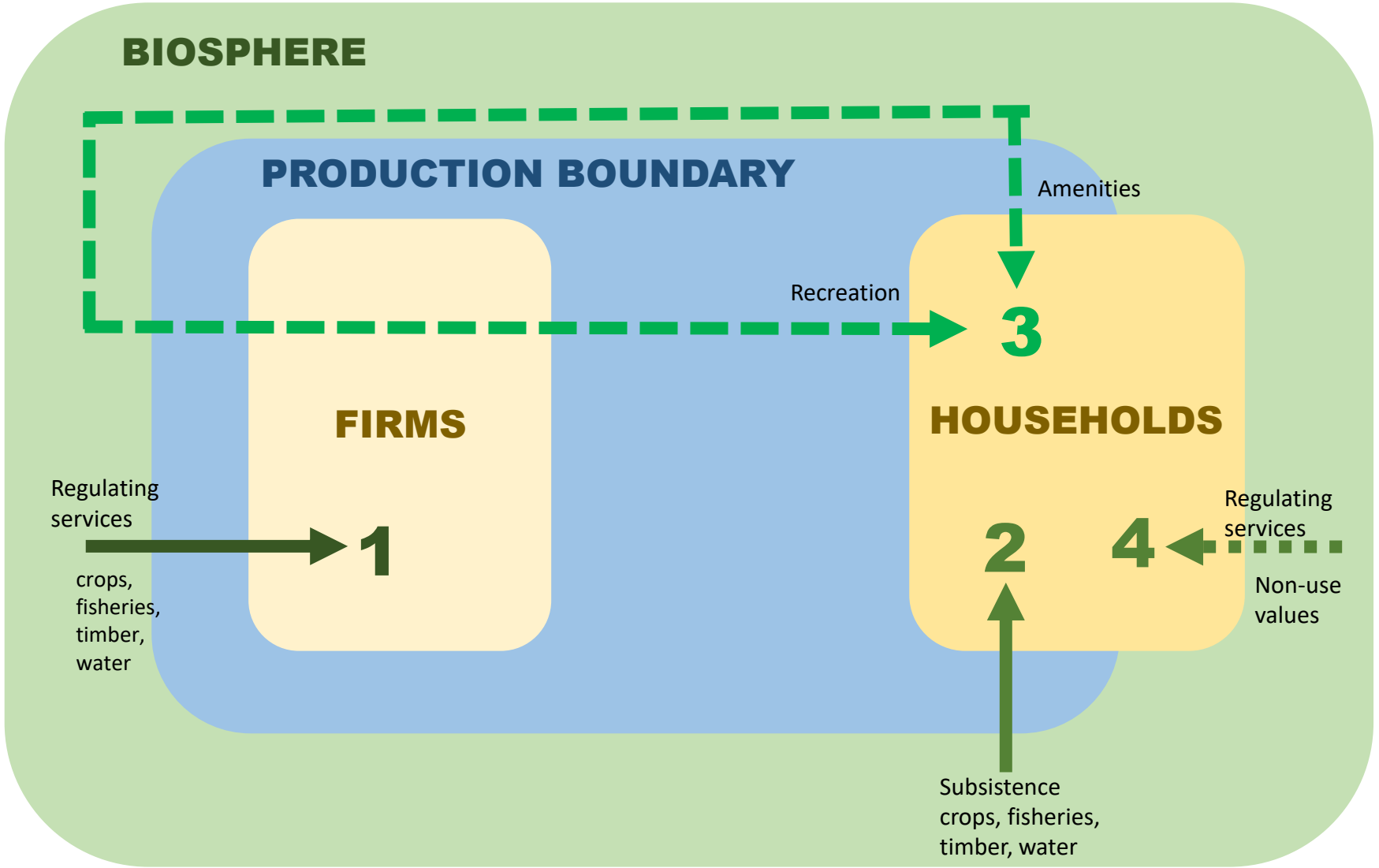
Contents of Discussion Paper 5.1

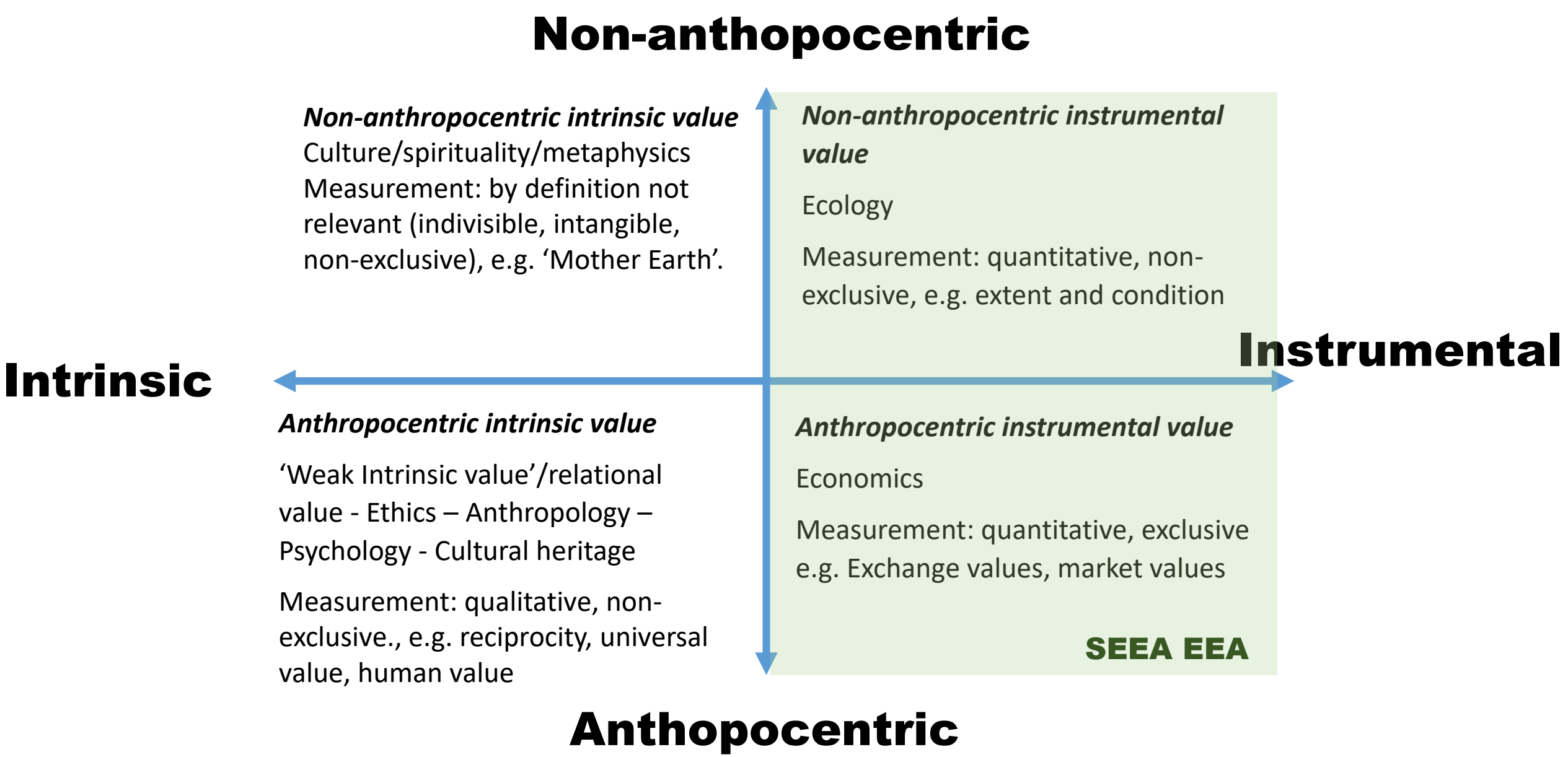


1 Valuation principles in the national accounts



1. Final ecosystem services as inputs to firms
2. Final ecosystem services as inputs to households
3. Final ecosystem services with benefits to households co-produced by households and firms
4. Final ecosystem services with benefits to households which are not accounted in the final value of any marketed good or service

2 Accounts relative to wider valuation frameworks



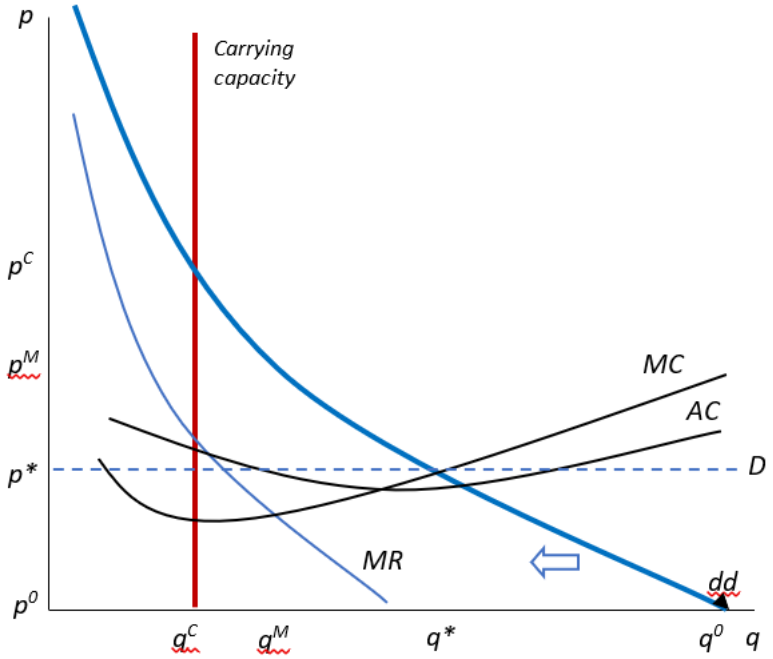
3 Value and price concepts in environmental economics in the context of national accounts

Exchange values

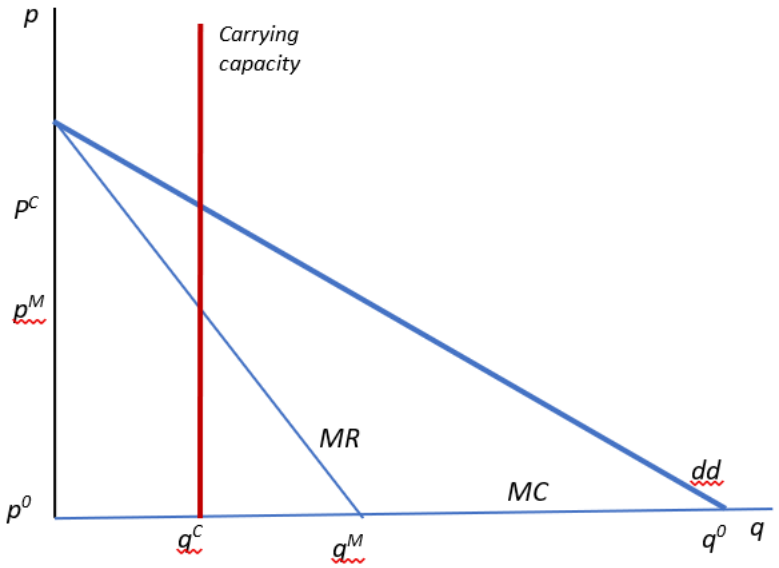
Market simulation where no markets exist, using the most likely institutional context

<u>Institutional issues</u>:
Consistency
Credibility (likelihood)
Comparability

Ease of calculation



e.g. short-term monopolistic competition with linear site-specific demand and constant costs



Deductive valuation methods

involve logical processes to reason from general premises to particular conclusions using constructed models comprising a set of behavioral postulates e.g. about input-output relationship, and forecasting of input prices

Inductive valuation methods

reasoning from the particular to the general, or from real-world data to general relationships, using formal statistical or econometric procedures to infer generalizations from individual observations

4 Assessing valuation methods in the context of national accounts.

Group	Type	Method	Description	Computational demand	Result	Provis-ioning	Regul-ating	Cult-ural
Deductive methods	Cost-based using market prices	Damage costs avoided	Monetary value of damages avoided (as an upper estimate of WTP)	Spreadsheet analysis	Point estimate		X	
		Restoration cost	Cost of replacing the ecosystem asset. Values a bundle of services	Spreadsheet analysis	Point estimate		X	
		Replacement cost	Cost of replacing the service. In rare cases this might be the restoration cost.	Spreadsheet analysis	Point estimate		X	
	Residual	Unit resource rent	Prices determined by deducting costs of labor, produced assets and intermediate inputs from market price of outputs (benefits).	Spreadsheet analysis	Point estimate		X	
		Change in net rent	Similar to unit resource rents, but to value partial changes in the ecosystem service supply (instead of discrete change). Does not hold other inputs constant.	Spreadsheet analysis	Marginal Product		X	
		Mathematical programming	Derive producers' rents or marginal costs using optimization model	Linear programming	Marginal Product		X	
Simulated exchange price and quantities			Prices are estimated by utilizing an appropriate demand function and setting the price as a point on that function using (i) observed behavior to reflect supply (e.g. visits to parks) or (ii) modelling a supply function.	Econometrics	Hypothetical exchange value		?	
Market prices and quantities			Observed prices, quantities and input costs. Includes actual damage costs	Spreadsheet analysis / econometrics	Observed exchange value	X	X	X
Inductive methods	Revealed prefer-ence	Production & cost functions	Econometric analysis of industry data	Econometrics	Demand function		X	
		Travel cost methods	Econometric analysis of visitor travel cost data to derive demand curve	Econometrics	Demand function			X
		Hedonic pricing	Econometric analysis of property data to derive demand curve for environmental characteristics	Econometrics	Demand function			X
		Averting behavior	Actions taken to avoid experiencing an external damage, as partial measure	Econometrics	Demand function		X	
	Stated preference	Contingent valuation method	Statistical analysis of answers on WTP for a change in environment	Econometrics	Demand function	X		X
		Choice modelling	Statistical analysis of answers on WTP for a change in environment	Econometrics	Demand function	X		X

4 Assessing valuation methods in the context of national accounts.

Group	Type	Method	Description
Deductive methods	Cost-based using market prices	Damage costs avoided	Monetary value of damages avoided (as an upper estimate of WTP)
		Restoration cost	Cost of replacing the ecosystem asset. Values a bundle of services
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Market prices and quantities			Observed prices, quantities and input costs. Includes actual damage costs
Inductive methods	Revealed prefer-ence	Production & cost functions	Econometric analysis of industry data
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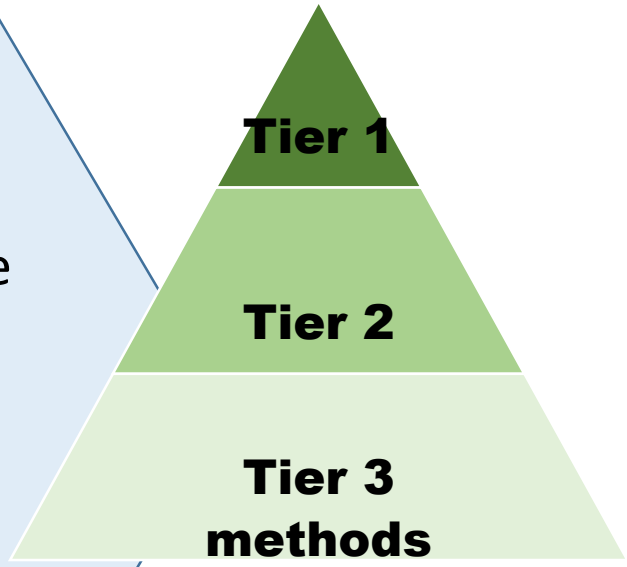
	Stated preference	Contingent valuation method	Statistical analysis of answers on WTP for a change in environment
		Choice modelling	Statistical analysis of answers on WTP for a change in environment

Criteria for method selection*

1. Compatible with exchange values
2. Identifies individual service
3. Inductive before deductive...
4. ...allows reliable extrapolation
5. ...low cost of input data
6. ...ease of computation



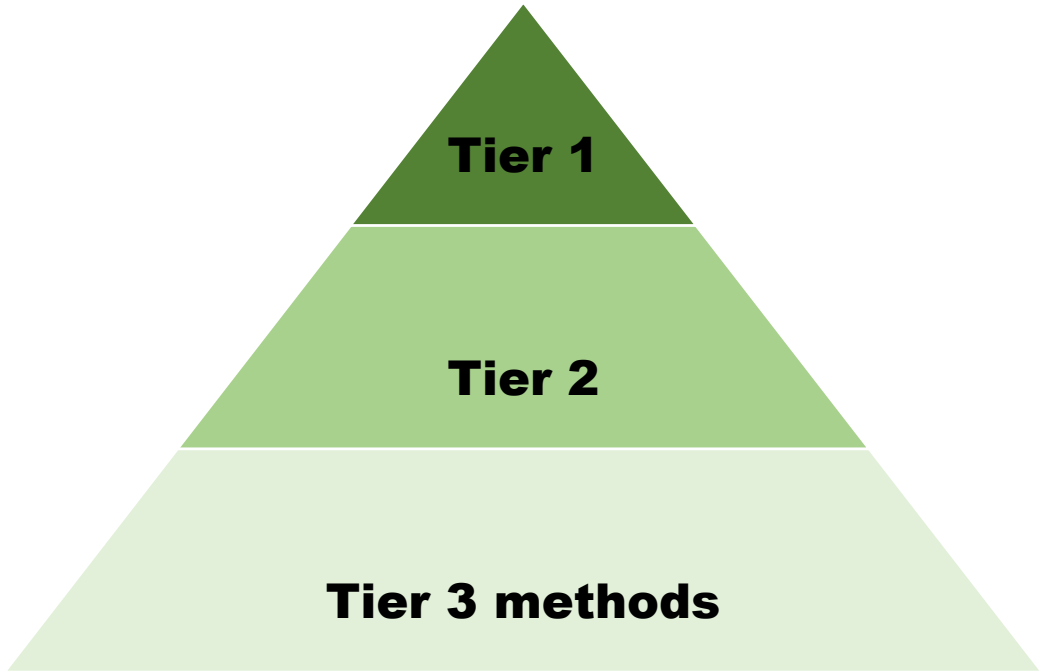
*How much of a choice do we have in practice?

4 Assessing valuation methods in the context of national accounts.

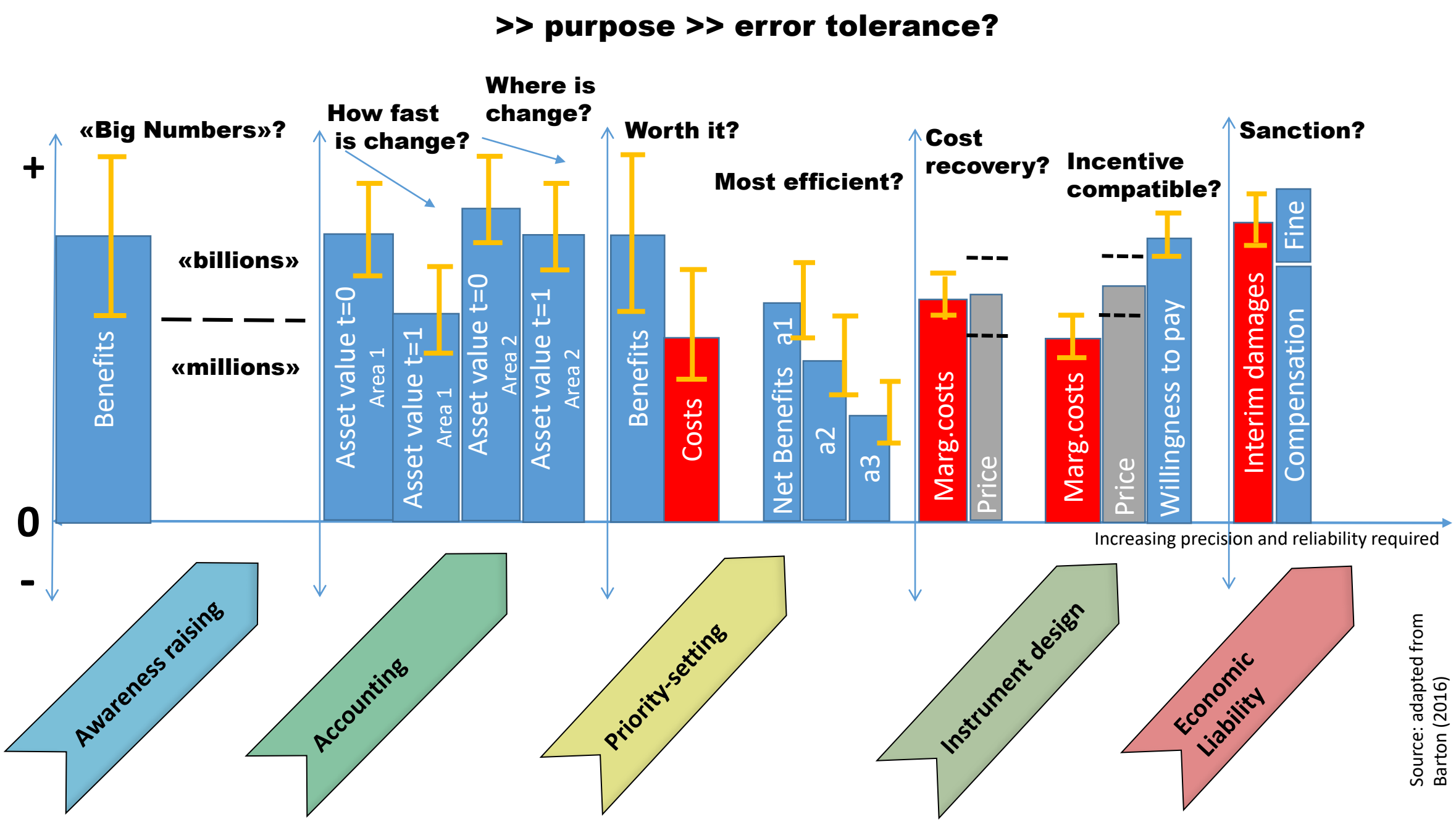
Ranking by use or frequency of recommendation in WG3 discussion papers on ecosystem services:

	DEDUCTIVE METHODS								INDUCTIVE METHODS					
	Avoided damage costs (health, carbon)	Replacement cost	Alternative cost	Avoided treatment &infrastructure cost	Restoration cost	Residual value	Simulated exchange - stated preference	Market prices (trading, leases, rights, PES)	Demand function	Production function	Travel cost methods	Hedonic pricing	Costs of averting behaviour	Contingent valuation
Harvested & cultivated terrestrial and aquatic resources		3				1		2						
Water supply			4			2			1	3				5
Carbon sequestration	2							1						
Soil retention	1	1			1									
Air filtration	1											3	2	
Water purification	1			1			3	2						
River flood regulation	1	1												
Coastal flood regulation	1	1												
Flow regulation				1										
Recreation services							3	2			4	1		

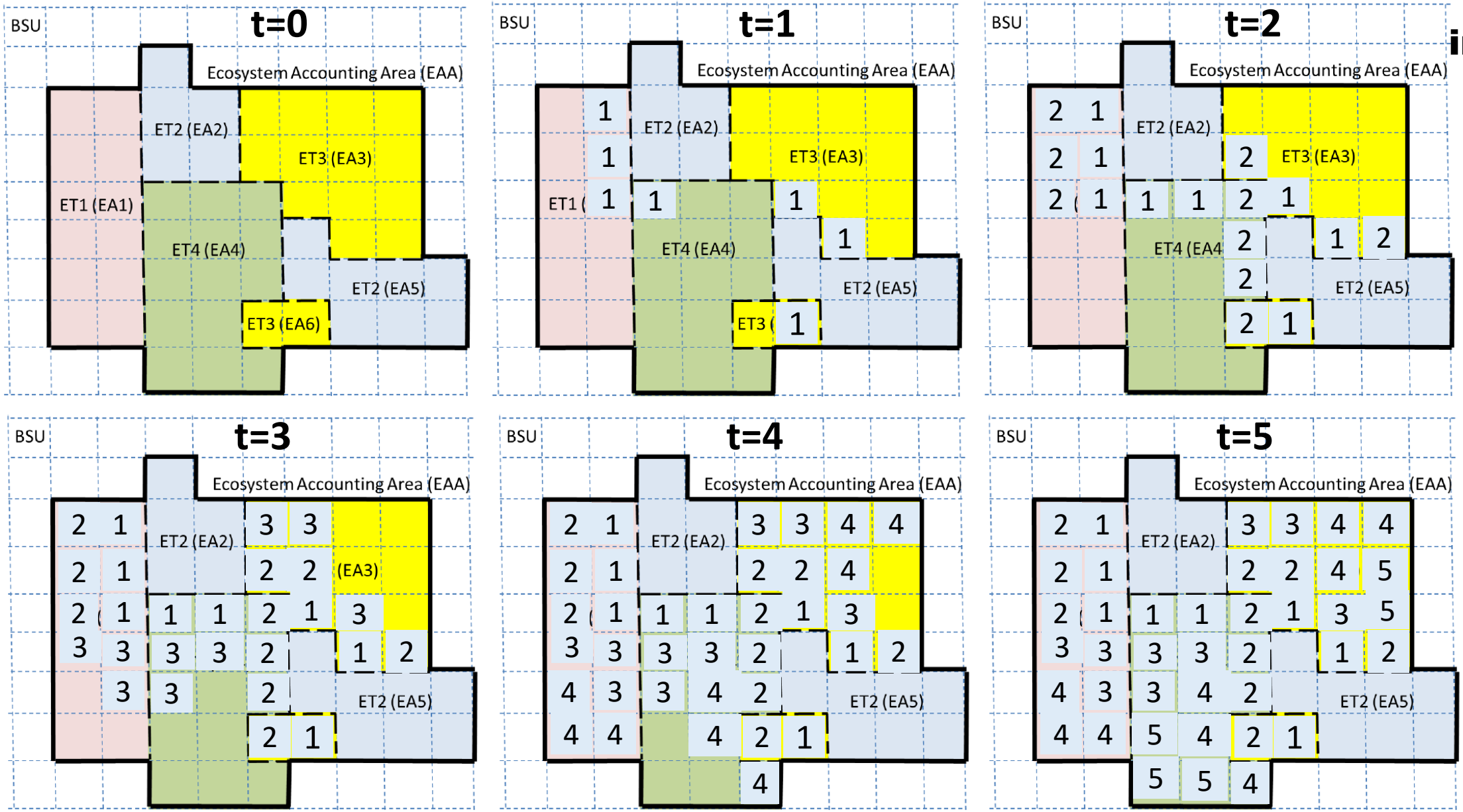
Work in progress for valuation guidelines



5 Value transfer in accounting – expectations about accuracy



5 Value transfer in ecosystem accounting



constant incremental spatial change

non-linear change in substitutes and compl-ements

fluctuation in values per ecosys asset unit

Source: Adapted from SEEA EEA Figure 2.4 (UN et al., 2014b). Note that Ecosystem Assets (EA) represent individual, contiguous ecosystems. Ecosystem Types (ET) are EA of the same type.

Changes or levels - what are the purposes of accounting?

Problematic interpreting marginal prices as average prices?

Marginal prices with non-marginal changes in ecosystem services?

6 Unresolved and emerging issues – marginal versus average?

ES production functions need to be sensitive to changes in ecosystem condition

Using marginal prices for gradually changing ES across multiple accounting periods?

Is ecosystem accounting a plural valuation approach?

Bridging tables for different economic value metrics?

6 Unresolved and emerging issues - plural and incommensurate values?

Satellite accounts for incommensurable value metrics?

Use transaction cots to assess the relative credibility of institutions?

Can we disregard the 3rd party transaction criterion for ecosystems; for individuals?

6 Unresolved and emerging issues - credible institutions?

Credibility of institutional assumptions of cost-based versus simulated exchange methods?

Cost of provision rather than exchange values?

Expectations regarding accuracy? Inductive versus deductive valuation

No single price for ES due to transport costs and resource immobility?

6 Unresolved and emerging issues - spatially explicit values

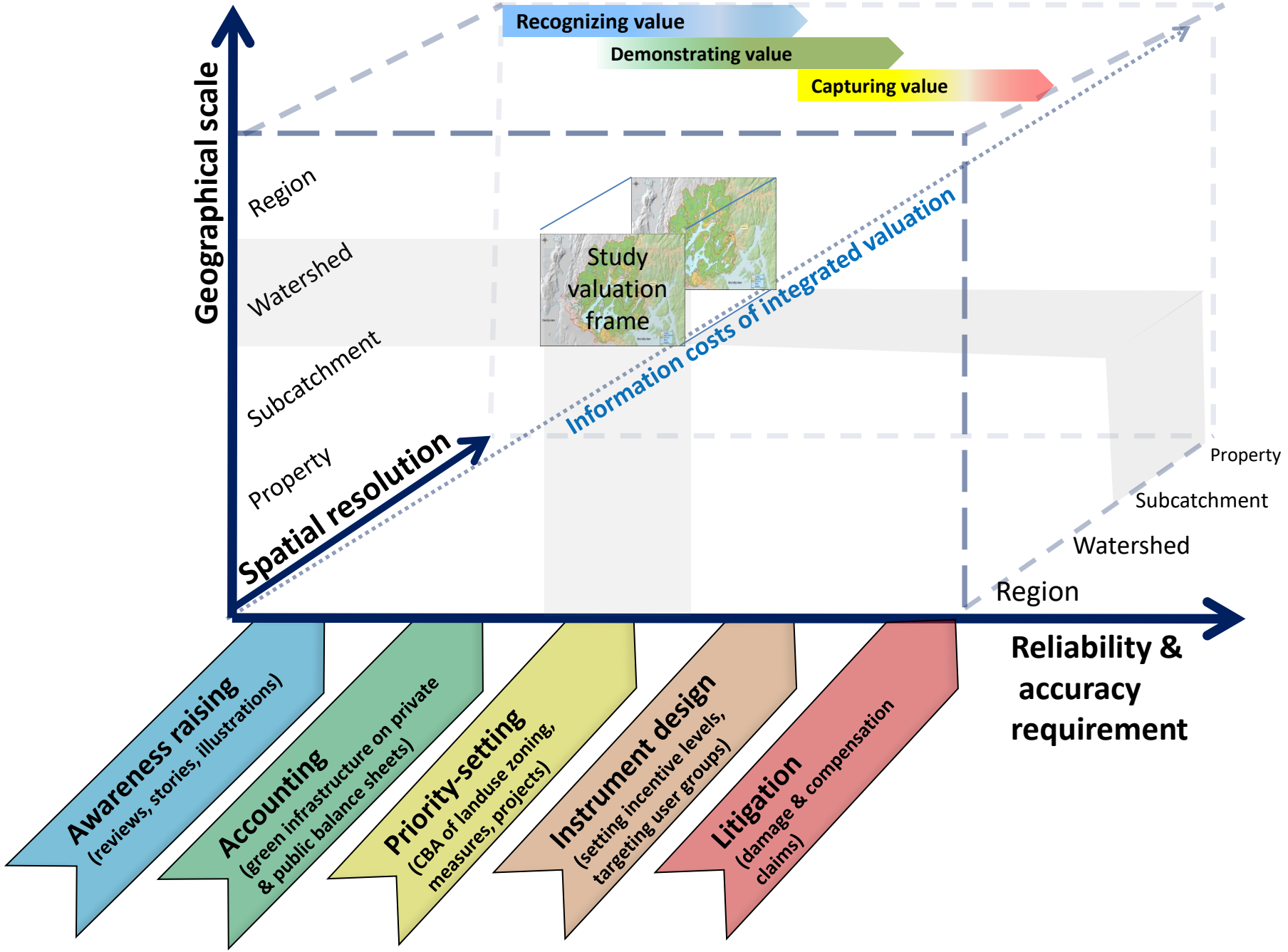
Typically spatially explicit physical flows combined with average prices?

..accounts only reliable for assessing changes (not levels)?

THANK YOU

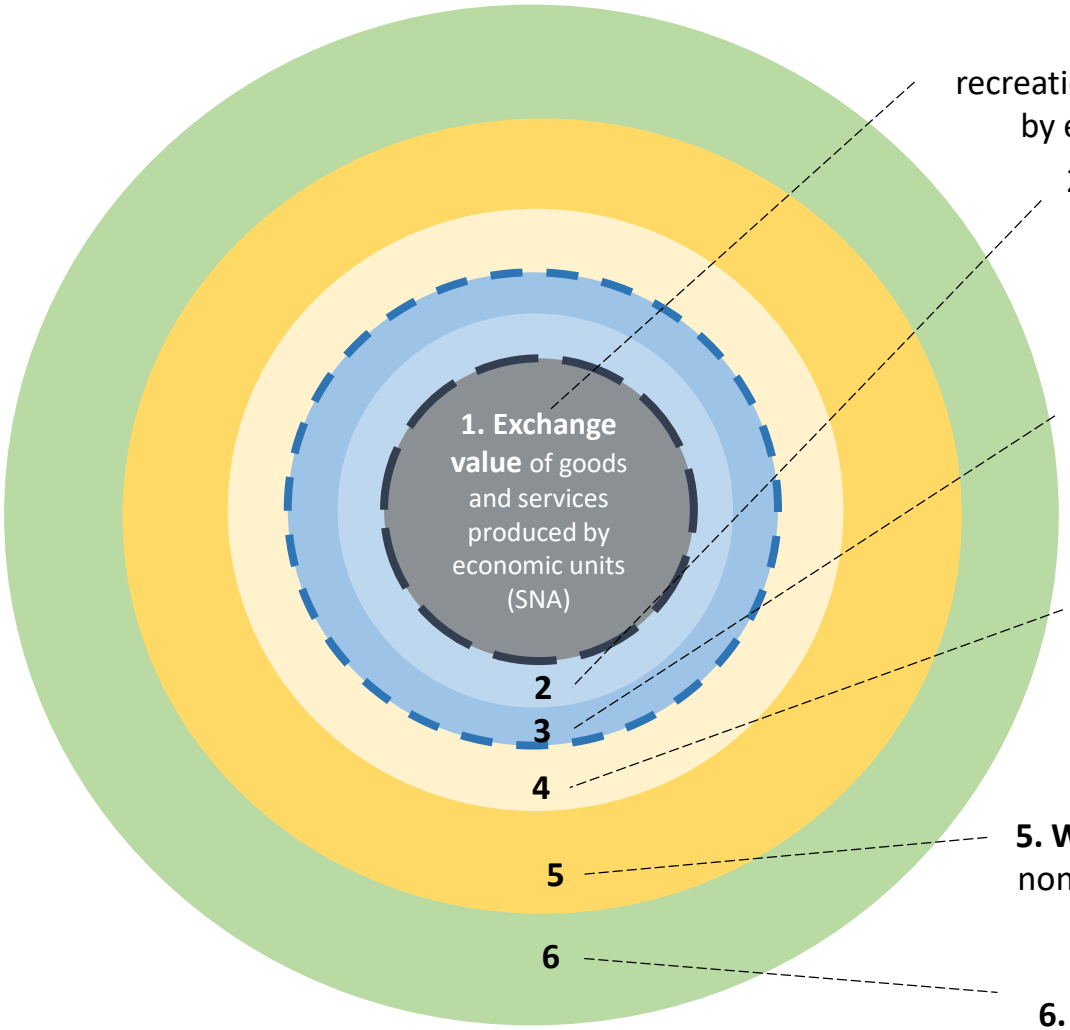
QUESTIONS
SUGGESTIONS

EXTRA MATERIAL



Source: adapted from Gomez-Baggethun and Barton(2013)

How can other values be identified in national ecosystem accounting ?



1. Exchange value of recreation services *produced* by economic units (SNA)

2. **Exchange value** of ecosystem services *contributed* to recreation (outside SNA)

3. **Exchange value** of recreation services via complementary goods (outside SNA)

4. **Economic welfare value** of recreation services consumer surplus (SNA incompatible)

5. Well-being and health non-economic indicators

6. Ecosystem condition indicators related to recreation, but not used in valuation

Examples:

Forest cabin rental charge per night

Cabin timber
Firewood
Well water
Mushrooms
Berries

Travel time & cost to reach cabin

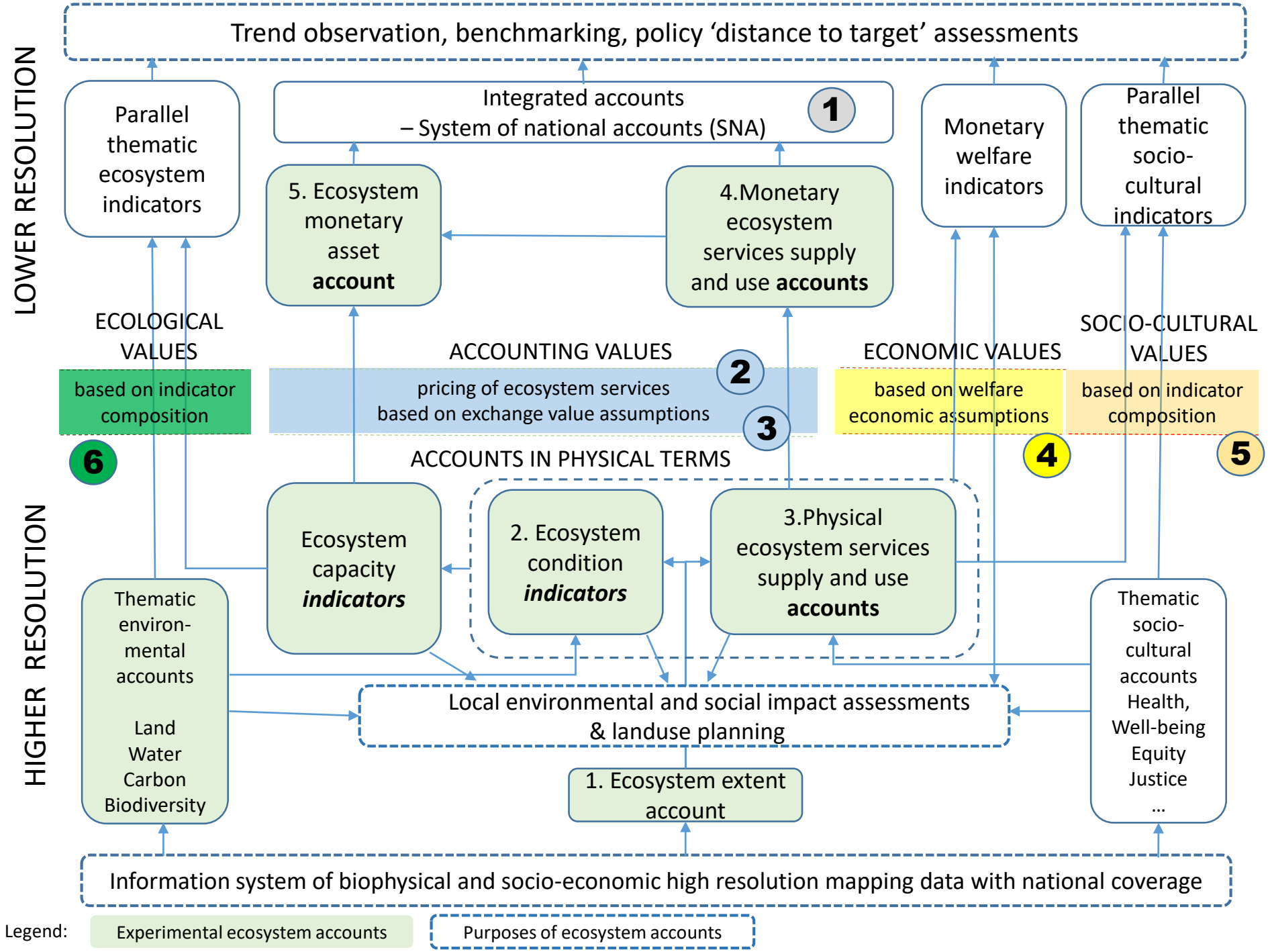
Willingness-to-pay for cabin stay minus cabin rental

Time spent in forest; stated suitability, subjective health scores…

Old growth forest charistmatic biodiversity…

Source: adapted from Barton et al. 2017a based on observationsby Carl Obst and Lars Hein, gratefully acknowledged.

Getting plural values into ecosystem accounting?



Source: based onOpenNESS Policy Brief #5