The European Commission's science and knowledge service

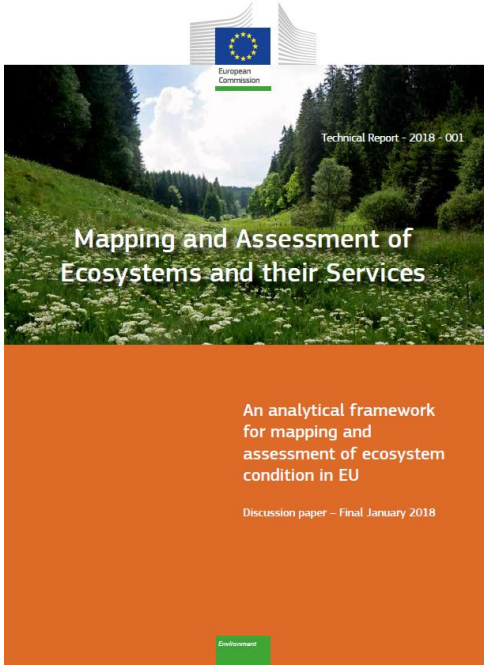
Joint Research Centre

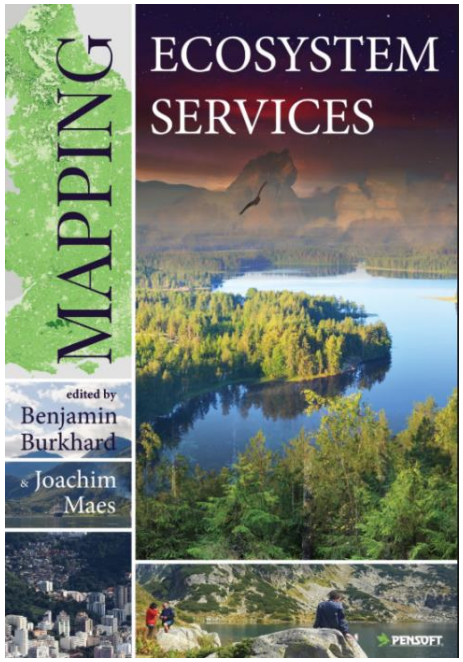
Research Area 2
Ecosystem condition

Joachim Maes

European Commission

- Joachim Maes
- European Commission – Joint Research Centre
- Biodiversity and ecosystem services (support to the EU policy on biodiversity)
- Ecosystem condition
- @MaesJoachim
- https://orcid.org/0000-0002-8272-1607





https://seea.un.org/events/2019-forum-experts-seea-experimental-ecosystem-accounting

Discussion paper 2.1: Purpose and role of ecosystem condition accounts

Discussion paper 2.2: Review of ecosystem condition accounting case studies: Lessons learned and options for developing condition accounts

Discussion paper 2.3: Proposed typology of condition variables for ecosystem accounting and criteria for selection of condition variables

Your annual physical check-up

Which questions?

Variables (Indicators)				
Units	yes/no	kg	mm Hg	beats/min
Type	pressure	state	state	performance
Reference	no	19<BMI<25	120/80	60-200
Aggregate		healthy	unhealthy	
Aggregate (2)		68.3%	31.7%	

The condition of ecosystems

What? Reflects the overall quality of an ecosystem asset in terms of its characteristics.

What steps to take to measure ecosystem condition and report it in an accounting table?
➔ Measuring and reporting ecosystem condition in **5 steps**.

Step 1. Select ecosystem type and spatial units

Condition is measured for a specific ecosystem type and within a certain area.

See previous sessions:

- Online modules on ecosystem types/spatial units

Step 2. Select indicators: Sources

ECOSYSTEMS AND PEOPLE
2019, VOL. 15, NO. 1, 156–172
https://doi.org/10.1080/26395916.2019.1609581

Taylor & Francis
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REVIEW

OPEN ACCESS Check for updates

Analysis of trends in mapping and assessment of ecosystem condition in Europe

Paula Rendon[a], Markus Erhard[b], Joachim Maes[c] and Benjamin Burkhard[a,d]

DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS
STATISTICS DIVISION
UNITED NATIONS

System of Environmental Economic Accounting

SEEA EEA Revision

Working group 2: Ecosystem condition

Discussion paper 2.2: Review of ecosystem condition accounting case studies: Lessons learned and options for developing condition accounts

final version

Type of indicator	Group of indicators	N°
State	Environmental state	345
	Land Use/Land cover	100
	Conservation status	79
	Red List conservation status	22
Pressure	Human disturbance	150
	Pollution	139
	Natural system modifications	122
	Agriculture	80
	Urbanisation	57
	Sylviculture	37
	Invasive Alien Species	35
	Climate change	29
	Fragmentation	29
	Mining	15
Biodiversity	Species diversity	263

Indicators for ecosystem condition

Marine ecosystems

Pressure indicators

Water quality

Terrestrial ecosystems

Land cover and land use statistics

Freshwater ecosystems

Biodiversity indicators

Water quality

Typology for indicators

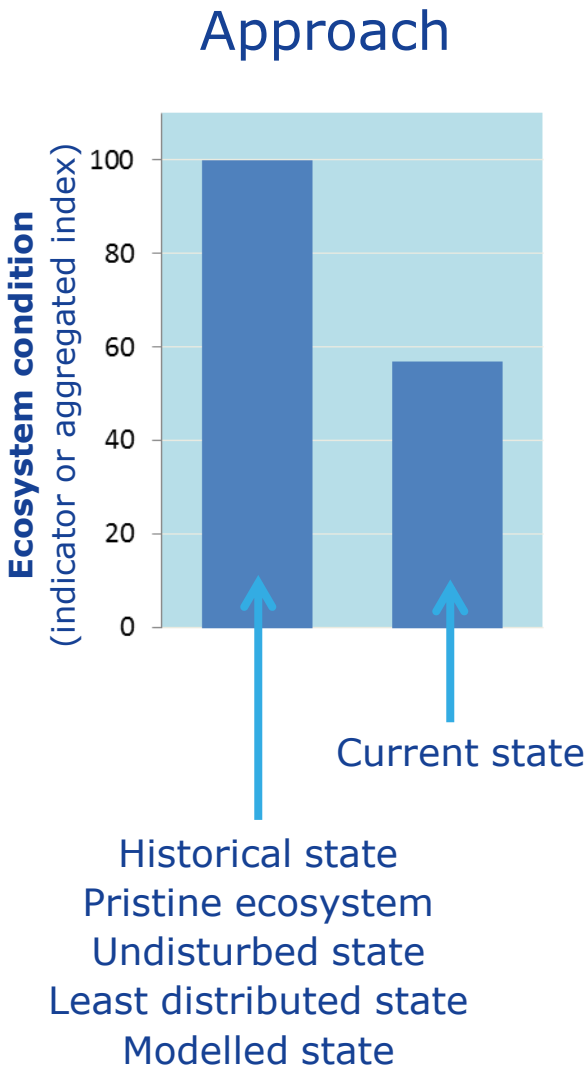
Table 2. Proposed typology for classification of ecosystem condition variables and indicators.

Ecosystem condition	Abiotic characteristics	Physical state
		Chemical state
	Biotic characteristics	Composition (including species-based indicators)
		Structure (including vegetation, biomass, food chains)
		Function (including ecosystem processes, disturbance regimes)
	Landscape and seascape level characteristics	Landscape diversity of biotic or abiotic characteristics
		Spatial distribution of characteristics such as connectivity, fragmentation

Discussion paper 2.3 contains a previous version of this typology as well as selection criteria for ecosystem condition indicators

Step 3: Define a reference

- Proposal: The **reference condition** represents the condition of an ecosystem necessary to maintain its ecological integrity ("the natural state").
- A point against which to compare past, present or future condition.
- The reference condition does not imply a policy goal, target or desired state.



Step 4: Aggregation (if wanted)

- Purpose: a single or aggregated index for ecosystem condition based on multiple metrics or indicators for condition

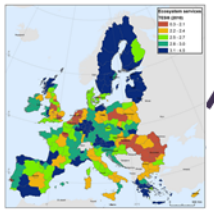
- Thematic aggregation: Aggregating different indicators to deliver one single value

- Spatial aggregation: Averaging or summing values of one indicator over space

1. Mapping ecosystems

2. Mapping ecosystems condition

3. Thematic aggregation



3. Reporting in a table (spatial aggregation)

Grassland	Percentage of ecosystem extent
Poor	5%
Moderate	50%
Good	30%
Excellent	15%

Options for aggregation

- **Simple aggregation**: scale all indicators between 0 and 1 (or another number) and to sum them.
- **Hierarchical aggregation**: Ensure a balanced basked of indicators (based on a typology)
- **Weighed aggregation**: give more weight to certain indicators

Step 5. Report the account

Two main approaches

- Report the condition indicators (or an aggregated condition index) as opening and closing stocks for different years

- Report the extent of ecosystem types over different categories of condition (this requires thematic aggregation)

Examples of condition tables

- Wetland accounts, UK: Khan, J., Din, F. (2015) UK Natural Capital – Freshwater Ecosystem Assets and Services Accounts. Office for National Statistics

- River accounts, South Africa: Nel, J.L., Driver, A. (2015). National River Ecosystem Accounts for South Africa. Discussion document for Advancing SEEA Experimental Ecosystem Accounting Project. South African National Biodiversity Institute, Pretoria

Table 1 - Wetland ecosystems assets account

	Ecosystem Extent	Characteristics of condition				
	Land cover	Ecological condition		Soil		Accessibility
Indicators		Wetland birds	Mean species richness	Mean total nitrogen stock	Mean carbon conc[6]	Accessible wetlands - population with access to wetlands within X kilometres[1]
Units of measure	Size of area (hectares in '000)	No. of wetland birds at inland wetland sites in the UK ('000)	Diversity of species per pond	Mean total nitrogen in soil(% of dry soil)	Mean level of carbon in soil in (gram/ kilogram^{-1})	-
Year 2008	2833 (2007)[2]	4666	39.1 (2007)	1.5 (2007)	401.2 (2007)	-
Net change[3]	0	163	-5.4	[4]-0.2	-17.2	-
Year 2012	2833[5]	4829	33.7	1.3	384.0	-

Typology Indicators

Opening stock

Closing stock

Table notes:

1. Further analysis is required to develop this indicator.
2. The bracket shows the year of the data.
3. Net change is the difference between the opening and the closing period.
4. Expressed in percentage points.
5. These numbers are based on extrapolating from 1998 – 2007. The rate of change between 1998 and 2007 was not statistically significant and therefore the area of land cover is estimated to have remained the same.
6. Mean carbon concentration.

Table D: Ecosystem condition account for main rivers using four ecological condition indicators, 1999 – 2011

Kilometres	Degree of modification from natural					Total
	None/ small	Moderate	Large	Serious/ Critical	No Data	
FLOW						
Opening stock 1999	**34 084**	**22 814**	**10 328**	**5 447**	**3 637**	**76 310**
Opening stock as a % total river length	45	30	14	7	5	100
ncrease/decreases	-10 546	-2 316	6 017	5 129	1 715	
Increases/decreases as % opening stock	-31	-10	58	94	47	
Opening stock 2011	**23 538**	**20 499**	**16 345**	**10 576**	**5 352**	**76 310**
Opening stock as a % total river length	31	27	21	14	7	100
WATER QUALITY						
Opening stock 1999	**40 579**	**24 634**	**5 518**	**1 943**	**3 637**	**76 310**
Opening stock as a % total river length	53	32	7	3	5	100
Increase/decreases	-5 769	-3 591	6 149	1 496	1 715	
Increases/decreases as % opening stock	-14	-15	111	77	47	
Opening stock 2011	**34 810**	**21 043**	**11 667**	**3 439**	**5 352**	**76 310**
Opening stock as a % total river length	46	28	15	5	7	100
STREAM BANK/RIPARIAN HABITAT						
Opening stock 1999	**22 469**	**32 951**	**14 164**	**3 088**	**3 639**	**76 310**
Opening stock as a % total river length	29	43	19	4	5	100
Increase/decreases	-50	-3 612	1 255	1 667	740	
Increases/decreases as % opening stock		-11	9	54	20	
Opening stock 2011	**22 418**	**29 339**	**15 420**	**4 755**	**4 379**	**76 310**
Opening stock as a % total river length	29	38	20	6	6	100
INSTREAM HABITAT						
Opening stock 1999	**39 736**	**26 188**	**5 446**	**1 301**	**3 639**	**76 310**
Opening stock as a % total river length	52	34	7	2	5	100
Increase/decreases	-11 245	426	8 180	1 898	740	
Increases/decreases as % opening stock	-28	2	150	146	6 840	
Opening stock 2011	**28 491**	**26 615**	**13 626**	**3 200**	**4 379**	**76 310**
Opening stock as a % total river length	37	35	18	4	6	100

Indicators

Table E: Ecosystem condition account for rivers based on the aggregated ecological condition category, for main rivers, tributaries and all rivers

Kilometres	Degree of modification from natural					Total
	Natural	Moderately modified	Heavily modified	Unaccept-ably modified	No Data	
MAIN RIVERS						
Opening stock 1999	**46 541**	**22 315**	**2 791**	**1 026**	**3 637**	**76 310**
Opening stock as a % total river length	61	29	4	1	5	100
Increase/decreases	-24 100	9 467	13 168	1 465		
Increases/decreases as % opening stock	-52	42	472	143		
Opening stock 2011	**22 441**	**31 782**	**15 960**	**2 492**	**3 637**	**76 310**
Opening stock as a % total river length	29	42	21	3	5	100
TRIBUTARIES						
Opening stock 1999	**40 294**	**7 470**	**2 084**	**328**	**37 047**	**87 223**
Opening stock as a % total river length	46	9	2		42	100
Increase/decreases	-17 062	11 339	4 766	957		
Increases/decreases as % opening stock	-42	152	229	292		
Opening stock 2011	**23 232**	**18 809**	**6 850**	**1 285**	**37 047**	**87 223**
Opening stock as a % total river length	27	22	8	1	42	100
ALL RIVERS						
Opening stock 1999	**86 835**	**29 784**	**4 875**	**1 354**	**40 684**	**163 533**
Opening stock as a % total river length	53	18	3	1	25	100
Increase/decreases	-41 163	20 806	17 935	2 422		
Increases/decreases as % opening stock	-47	70	368	179		
Opening stock 2011	**45 673**	**50 591**	**22 810**	**3 776**	**40 684**	**163 533**
Opening stock as a % total river length	28	31	14	2	25	100

Conclusions

- Measuring ecosystem condition is like measuring human condition (similar approach)
- Some challenges remain (in particular with respect to reference levels of indicators or a reference condition of ecosystems)
- A condition account is important to assess the capacity of ecosystems to provide ecosystem services.