



Rijksinstituut voor Volksgezondheid
en Milieu
*Ministerie van Volksgezondheid,
Welzijn en Sport*

Functional parameters for sediment ecosystem services policy perspectives

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21-06-2013



ECOSYSTEM SERVICES

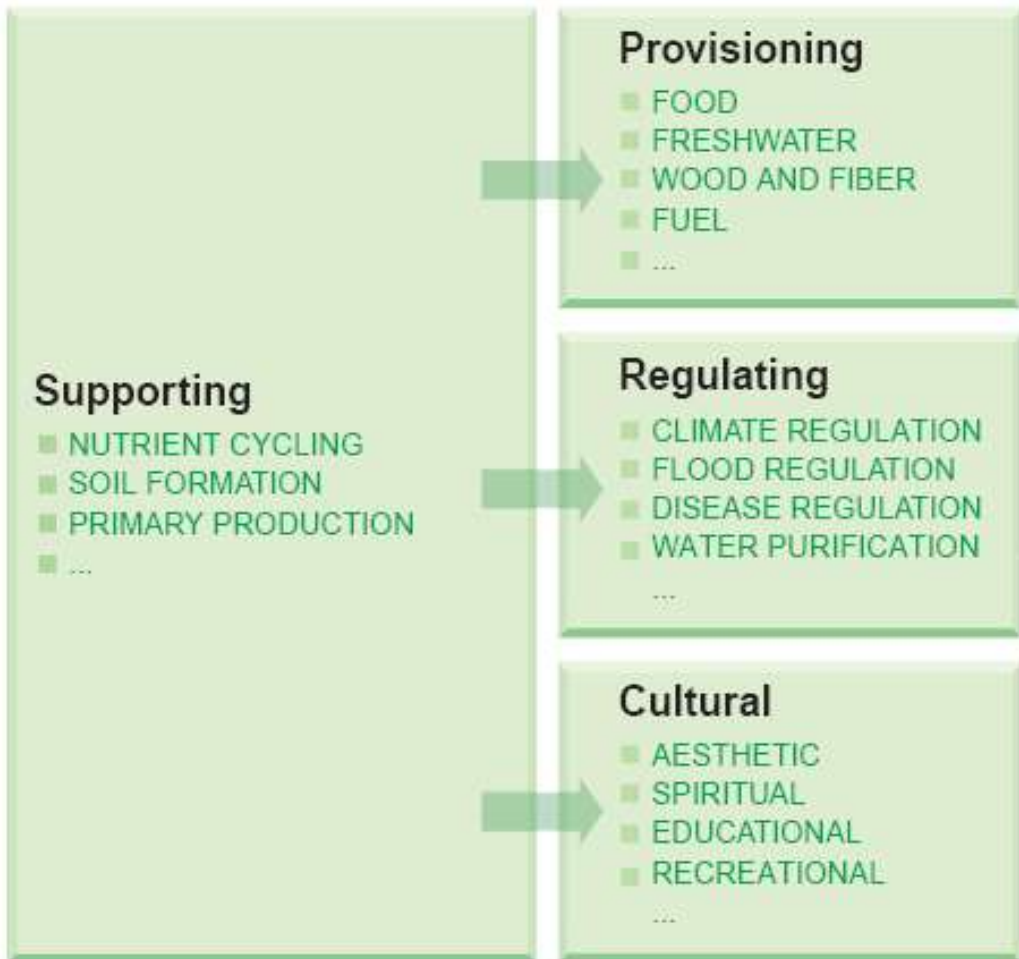


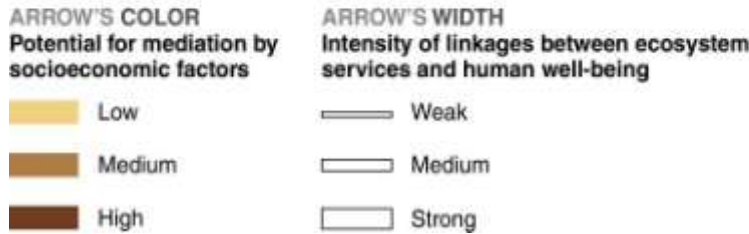
Fig. 1. Ecosystem services are the benefits that people obtain from ecosystems. They include provisioning, regulating, and cultural services that directly affect people, and supporting services needed to maintain the other services. Biodiversity underlies all ecosystem services (source: Millennium Ecosystem Assessment Synthesis Report, <http://www.maweb.org//en/Products.Synthesis.aspx>).



CONSTITUENTS OF WELL-BEING



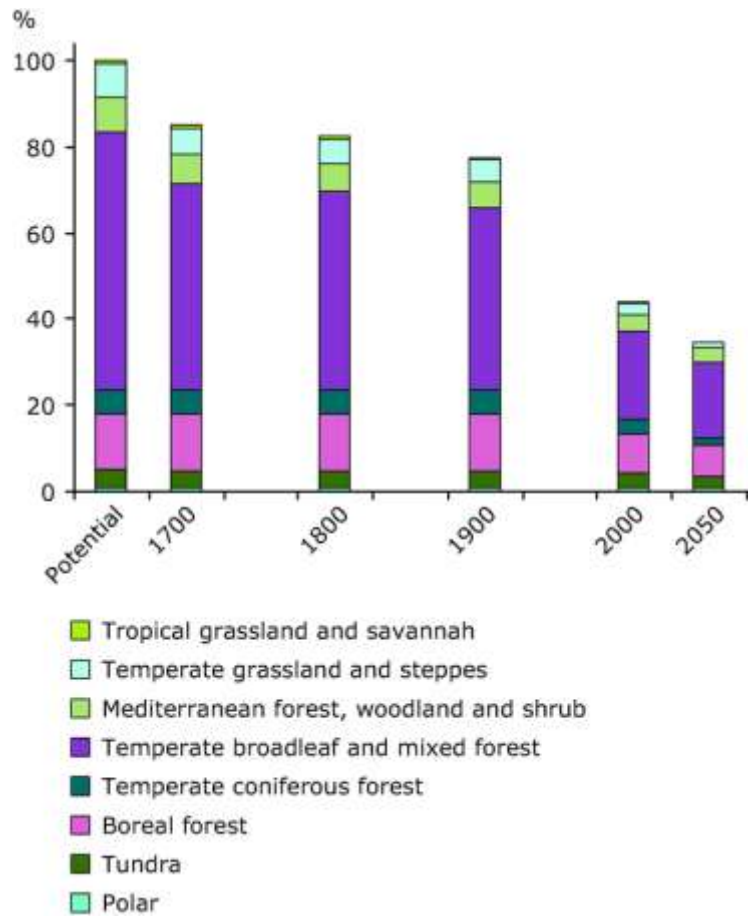
Source: Millennium Ecosystem Assessment





Biodiversity policy:

- Rio 1992: Biodiversity is to be protected because of its intrinsic and functional values
- Natura 2000
- Bird and Habitats Directive
- Water Framework Directive
- Identification of red list species
- Ecological network



Development of biodiversity in Europe 1700 – 2050 in the baseline scenario of the OECD Environmental Outlook to 2030



The value of the world's ecosystem services and natural capital

Robert Costanza^{*†}, Ralph d'Arge[‡], Rudolf de Groot[§], Stephen Farber^{||}, Monica Grasso[†], Bruce Hannon[¶], Karin Limburg^{#☆}, Shahid Naeem^{}, Robert V. O'Neill^{††}, Jose Paruelo^{‡‡}, Robert G. Raskin^{§§}, Paul Sutton^{||||} & Marjan van den Belt^{¶¶}**

Nature 387, 253-260 (1997)

conclusion:

total value of ecosystem services is twice the value of the gross national product of the world



UN actions:

- Millennium Ecosystem Assessment (2005)
 - (URL: <http://www.maweb.org/en/Synthesis.aspx>)
- TEEB (The Economy of Ecosystems and Biodiversity) (2010)
 - (URL: <http://www.teebweb.org>).



EU Biodiversity Strategy to 2020

"Halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss"

"No Net Loss"

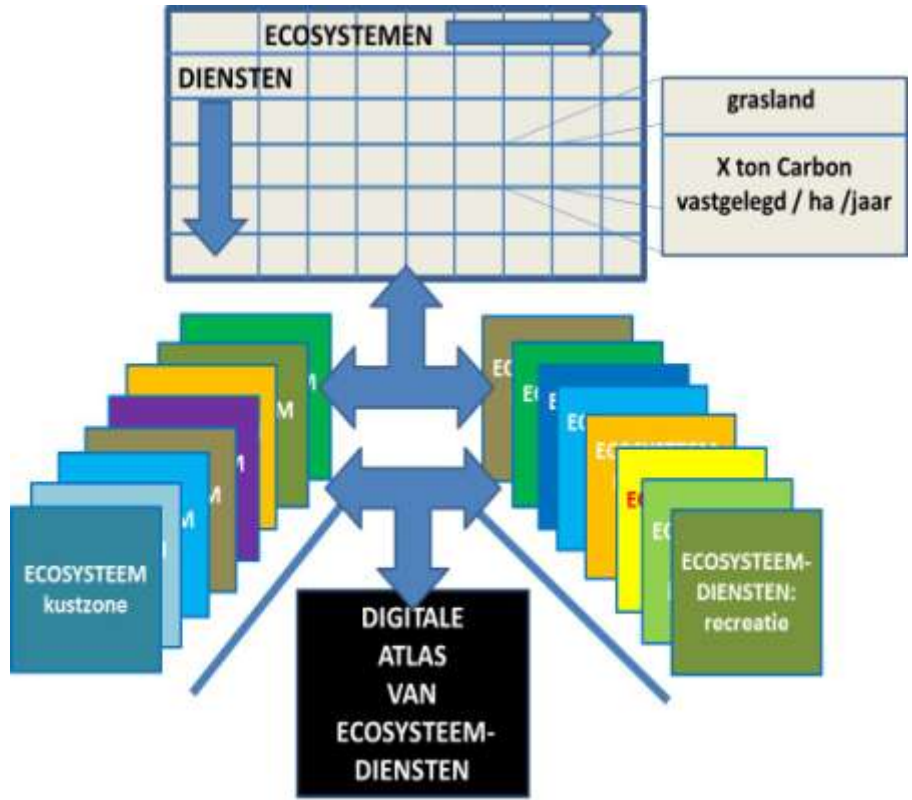


Biodiversity 2020

- National assessment of ecosystem services.
- MAES committee (2012)
 - Mapping and Assessment of Ecosystems and their Services
- CICES = common classification of ecosystems and their services
- Based upon existing data
- *The ministries of Economic Affairs and Infrastructure and Environment are working on a letter to parliament to underpin the importance of ecosystem services and the way The Netherlands is going to do this.*



Development of Digital Atlas of Natural Capital





ecosystems

functions

ecosystem services

ecological processes

genetic diversity

functional traits

biodiversity

species richness

biophysical structures

biotic interactions

state

present and future

socio-economic systems

ecosystem use and management
other capital inputs

human well-being

benefits

- nutrition, clean air and water
- health, safety, security
- enjoyment, ...

value

- economic value
- health value
- shared (social) value
- other values

drivers of change

response

- institutions, businesses
- policies (agriculture, forestry, fishery, environment, ...)
- stakeholders and users



Policy aims

- Sustainable use of ecosystem services
- Awareness raising
- Stakeholder commitment
- Development of indicators
 - Value
 - Status
 - > Physical
 - > Chemical
 - > Biological
 - > Functional
- Stories and examples
- Link to UN/OESO activities to the System of Environmental-Economic Accounting (SEEA)



Classification of ecosystems

	Wetlands	Mires, bogs and fens	Inland wetlands (marshes and peatbogs)	Specific plant and animal communities, water regulation, peat-related processes	Separation from grasslands (temporary inundation) and forests (tree canopy), HRL wetlands	EUNIS (SEBI, Baseline) UNEP/CBC* MA**	CLC HRL wetlands
Fresh water	Rivers and lakes	Inland surface waters (freshwater ecosystems)	Water courses and bodies incl. coastal lakes (without permanent connection to the sea)	All permanent freshwater surface waters	Underestimation of water courses and small water bodies needs application of external datasets (ECRINS, (HRL Small lakes)	EUNIS (SEBI, Baseline) WWF MA**	CLC HRL small water bodies ECRINS



Classification of ecosystems 2

Marine ¹⁸	Coastal wetlands	Periodically flooded by sea water, up to high tide mark, including salt marshes and intertidal flats	Intertidal areas	Interface of sea and land	Narrow shape needs application of external datasets	EUNIS (SEBI, Baseline)	CORINE LC
	Lagoons	Coastal lagoons that have permanent connection to the sea	Shallow brackish water bodies on landward side of coastline	Permanent water bodies that are not mapped as lakes	Differentiation from coastal lakes	EUNIS (SEBI, Baseline)	CORINE LC, GIS layer of WFD Lake water bodies
	Estuaries	River outlets influenced by tidal sea waters. MSFD water column type 'Variable salinity (estuarine) water' (= 'Transitional water bodies' <i>sensu</i> WFD) is the reference ¹⁹ .	Inland limit marked by upper limit of WFD Transitional waters	Transitional waters that are neither river nor sea	Water column and benthic ecosystem now considered together, but might need separate mapping ²⁰ .	EUNIS (SEBI, Baseline)	CORINE LC, GIS layer of WFD Transitional water bodies MSFD water column type 'Variable salinity (estuarine)



Specific ecosystem services

- Provisioning services
 - Plants and animals for food
 - Water for human consumption / agriculture / industrial / energy
 - Biotic material (incl. genetic resources and medical and cosmetic resources)
- Supporting and regulating services
 - Regulation of water quality and water flow
 - Atmospheric regulation
 - Nursery function
 - Maintenance element cycles
 - Maintenance habitat and gene pool protection
- Cultural services
 - Aesthetic / Heritage / recreation / information / knowledge

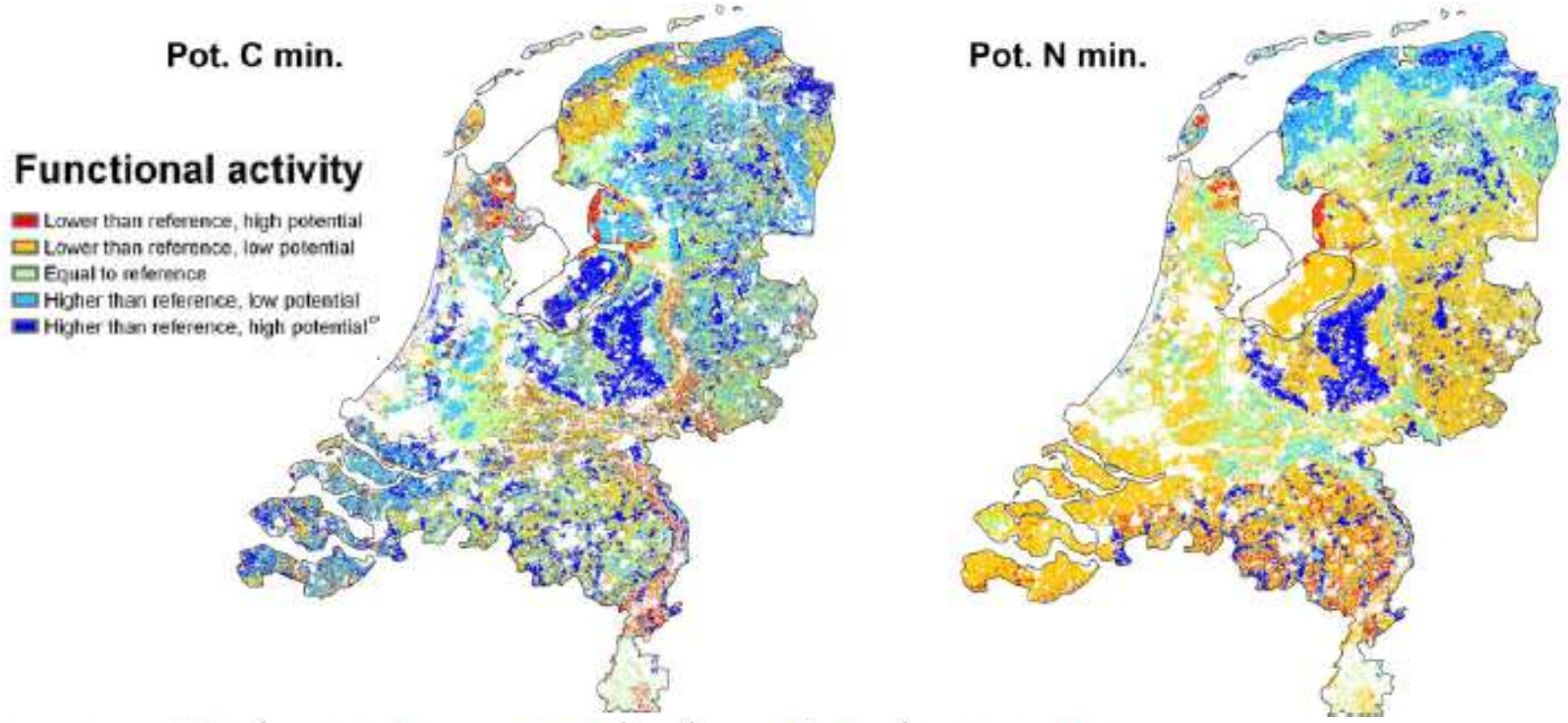


Ecosystem services sediments

- Provisioning services
 - Food (mussel, flatfish (tongue, plaice), prawn)
 - Methane formation (methane hydrate)
- Regulating services
 - Biodegradation / self purifying capacity
 - › Organic matter / Pollutants (aerobic and anaerobically)
 - › Element cycles
 - Soil formation: peat formation / floodplains
 - chalk cliffs, coral reefs
 - Protection
 - › Mangroves / seagrass / floodplains
- Cultural services
 - Aesthetics / heritage / recreation / tourism



Mapping ecosystem functioning



$$\text{PotC} = 4.688 \cdot 10^1 + (-4.607 \cdot 10^1 * [\text{arable farming}]) + (1.347 \cdot 10^2 * [\text{peat}]) + (6.06 * [\text{OM}])$$

$$\text{PotN} = 2.43 + (5.11 * [\text{pasture}]) + (7.10 * [\text{semi-natural grassland}]) + (1.511 \cdot 10^1 * [\text{peat}]) + (1.73 \cdot 10^{-11} * [\text{latitude}]^2) + (-1.1 \cdot 10^{-1} * [\text{pH}]^2).$$



Scientific Challenges

- Development of indicators
 - biophysical status
 - economic value
 - references (distance to target)
- Indicators are used for:
 - trend analysis
 - identification of distance to target
- Ideally an indicator can be influenced: provides possibilities to act



Summary

- Policy aim: sustainable use of ecosystem services
- 2020 goal: assessment of status and potential of ES

- Scientific goal: identify indicators to quantify and value ES
- Obtain ecological insights to influence ES status