Valuation of ecosystem services in an accounting context

Prof. Dr Lars Hein

Wageningen University

Contents of the presentation

- Introduction
  - Rationale for valuation
  - Challenges
- Valuation in SEEA –ecosystem accounting
  - Key concepts
  - Valuation approaches
  - Valuation methods
- Case studies
  - Limburg
  - Kalimantan

Why is it important to test valuation approaches for SEEA ecosystem accounting?

- Because the use of monetary indicators helps to communicate the consequences of ecosystem change to account users including policy makers
- To help connecting information from ecosystem accounts to the SNA
- To allow comparing effects of ecosystem change on different services within and between ecosystems
- Because it is often more straightforward to express ecosystem assets in monetary compared to physical indicators
- Because some services (e.g. ecosystem contribution to crop production) are more easily expressed in monetary compared to physical units

At the same time:

- Important to recognise that there is no consensus yet on the feasibility and accuracy of different valuation methods
- Further testing needed to examine if valuation of ecosystem assets can be done, how, for which services / asset types it is feasible, and how accurate it is.
- Valuation needs to be 'fit for purpose' : i.e. specific valuation approach consistent with SNA for ecosystem services and assets needs to be developed – using basic concepts and definitions of SNA and SEEA Central framework.

The ecosystem accounts (under development)

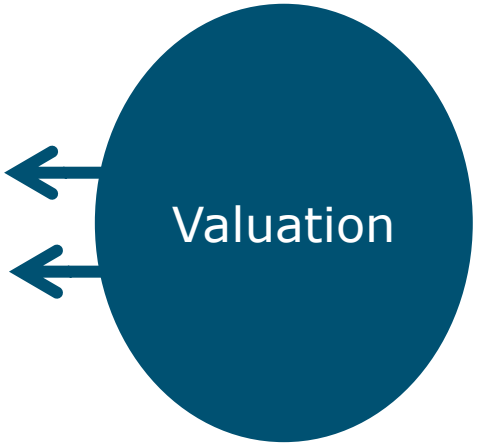
Core accounts

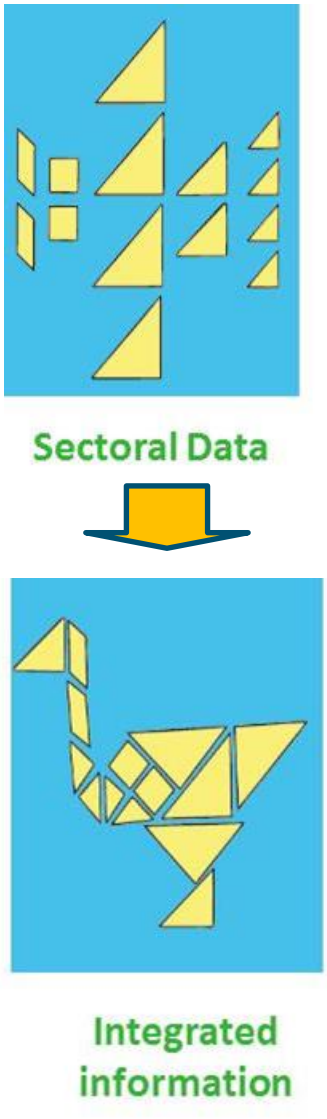
- Ecosystem extent;
- Condition;
- Ecosystem services supply and use;
- Assets

Thematic accounts

- Dealing with aspects such as land, water, carbon and biodiversity

Ecosystem accounting involves a combination of maps and tables





WAGENINGEN UNIVERSITY
WAGENINGEN UR

Source figures: UNSD

Valuation / concepts and considerations

- Ecosystem service = contribution of the ecosystem to human benefit / to production or consumption
- Ecosystem asset: relates to the ability of the ecosystem to generate ecosystem services now and in the future
- An ecosystem often generates more than one service: each service needs to be considered in analysing the ecosystem asset.
- The supply of services is interrelated: overharvesting of one service may jeopardize other (and/or the same) services.
- Asset defined in relation to the expected flow of services (under prevalent condition and ecosystem use pattern)

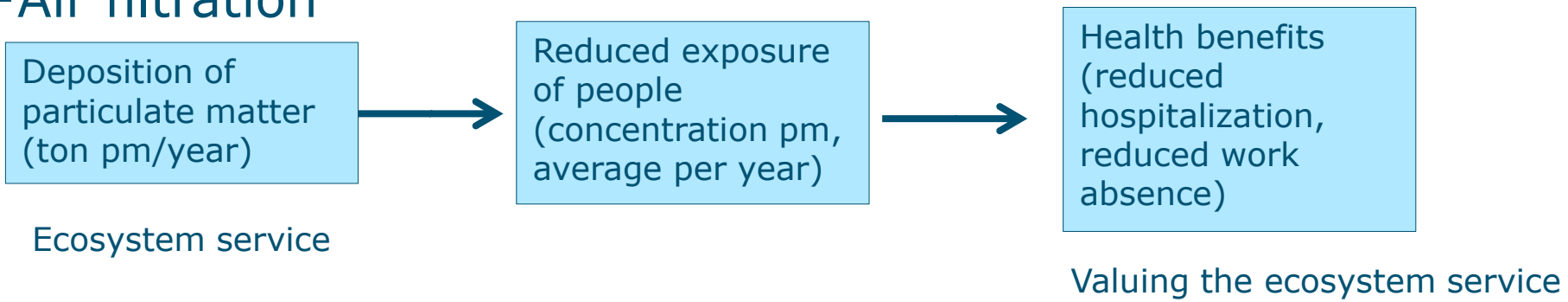
Valuation approach 1: Analysing and valuing ecosystem services based on benefits in the SNA

- Note: ecosystem accounting is about eliciting ecosystem contribution
- For some ecosystem services, benefits resulting from the services are already in the SNA (in general: provisioning services e.g. crop production, timber production as well as recreation)
- In this case, the service in physical (sometimes) and monetary (more often) terms can be derived from the SNA.
- In particular, a resource rent approach can be used to elicit the contribution of the ecosystem
- Maps can be produced through spatial allocation

Valuation approach 2: analysing physical and monetary indicators on the basis of mapping

- Most of the regulating services are not explicitly reflected in the SNA (e.g. carbon sequestration, water regulation, air filtration).
- Analysing these services generally involves the use of maps and models ('bottom-up').

- Air filtration



Valuation methodology to be based on SNA

- Private goods: valuation on the basis of exchange values, using appropriate prices (basic, producer)
- Often the benefit rather than the service is traded on the market
- Assets: valuation on the basis of prices for traded assets is usually not possible, hence on the basis of expected flows of services
- Principle in SNA (2008): Public goods (e.g. education) are valued at cost. I.e. as the sum of intermediate consumption, compensation of employees, consumption of fixed capital, other taxes (less subsidies) on production. This approach MAY also be applicable to public good ecosystem services.

Valuation of non-market goods in SEEA E.E.A.

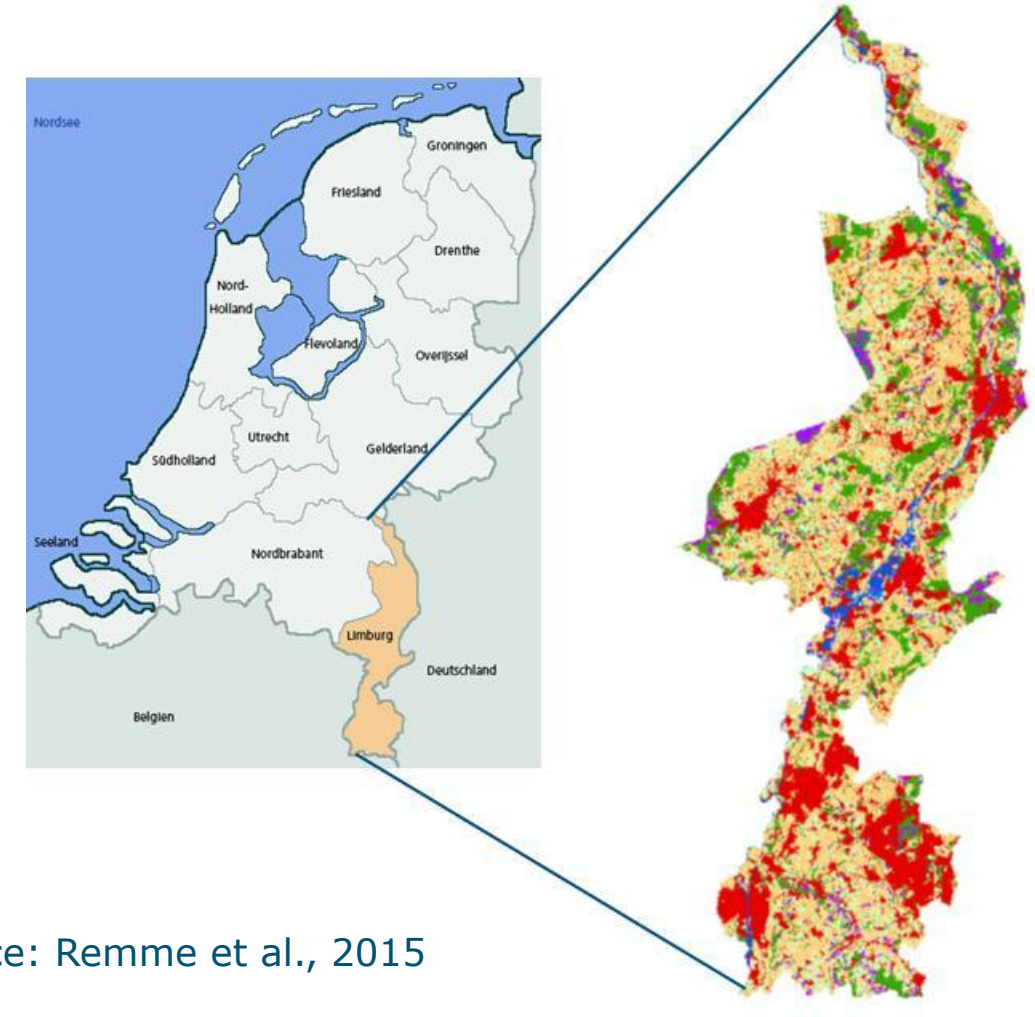
- Resource rent / production factor approaches: Estimating the contribution of ecosystem services to production in terms of their contribution to the value of the final product being traded on the market.
- Replacement costs (not restoration costs !): In case an ES provides input into a whole range of different benefits (e.g. a coastal protection service). In case it can be reasonably be expected that society would indeed replace the service if it was lost.
    - Example: the value of coastal protection equals the costs of dykes ***if*** these dykes would indeed be constructed
- Avoided damage cost: This valuation approach **may** be applicable where replacement investments are not likely to be made.
- Hedonic pricing: using statistics to elicit the contribution of the ecosystem to the price of a final good traded in a market

Challenges in valuation

- Zero resource rent for some open access resources
  - E.g. some fisheries
- Including disservices (e.g. pests, carbon emissions)
- Measuring and valuing degradation
  - Changes in asset value i.e. expected flow of services
  - Valuation on the basis of changes in the capacity to supply ecosystem services
- Intermediate services (to be included and if so valued??)
- Evaluating if avoided damage-costs are appropriate
  - e.g. for carbon
- Relation to SNA: e.g. valuing flood control, air filtration
- Analysing uncertainty

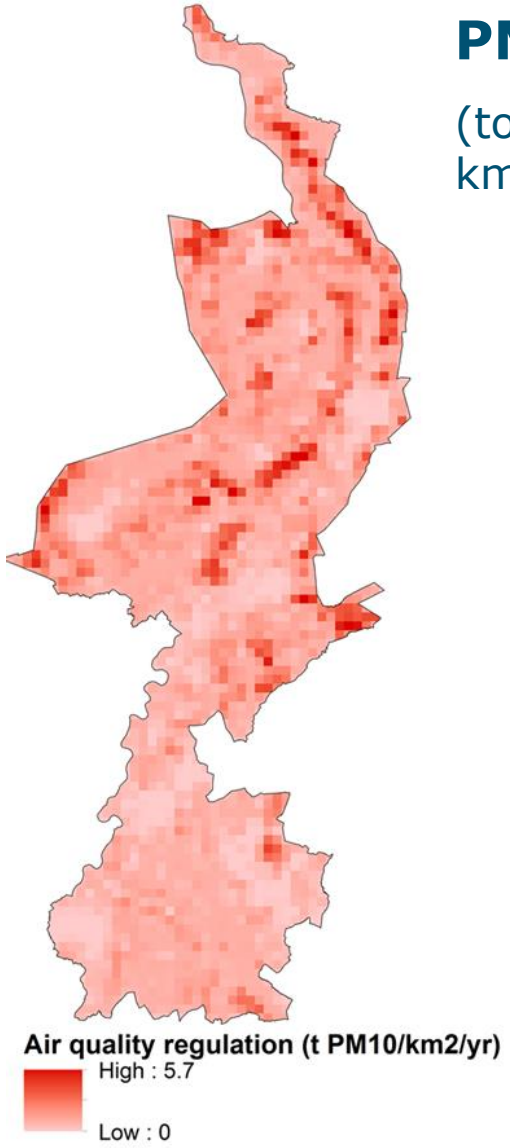
Ecosystem accounts example: Limburg

- Ecosystem accounts have been developed for Limburg Province, the Netherlands
- Including 7 ecosystem services provided by 8 types of land cover



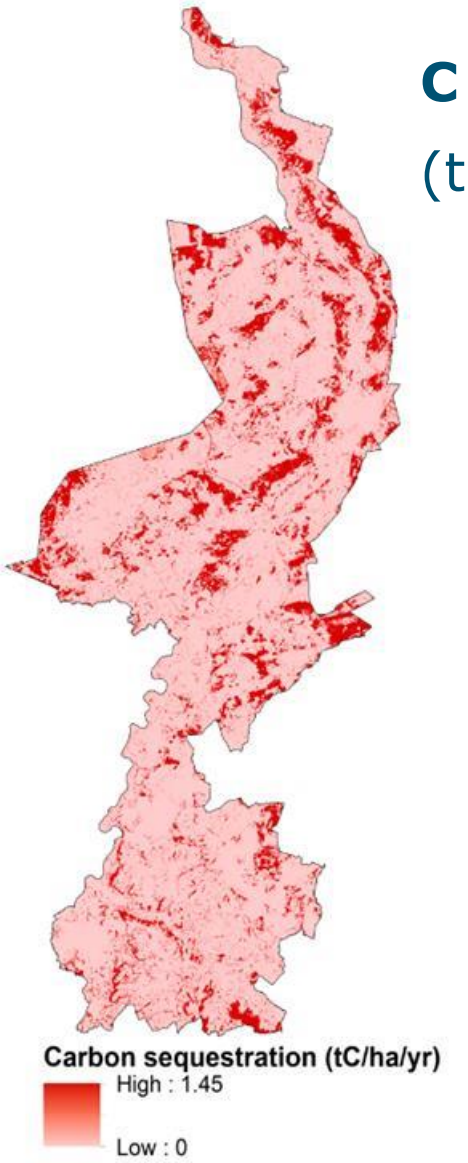
Source: Remme et al., 2015

Ecosystem accounts example: Limburg



PM_{10} capture

(ton PM_{10} captured/ km^2/year)



C sequestration

(ton C/ha/year)

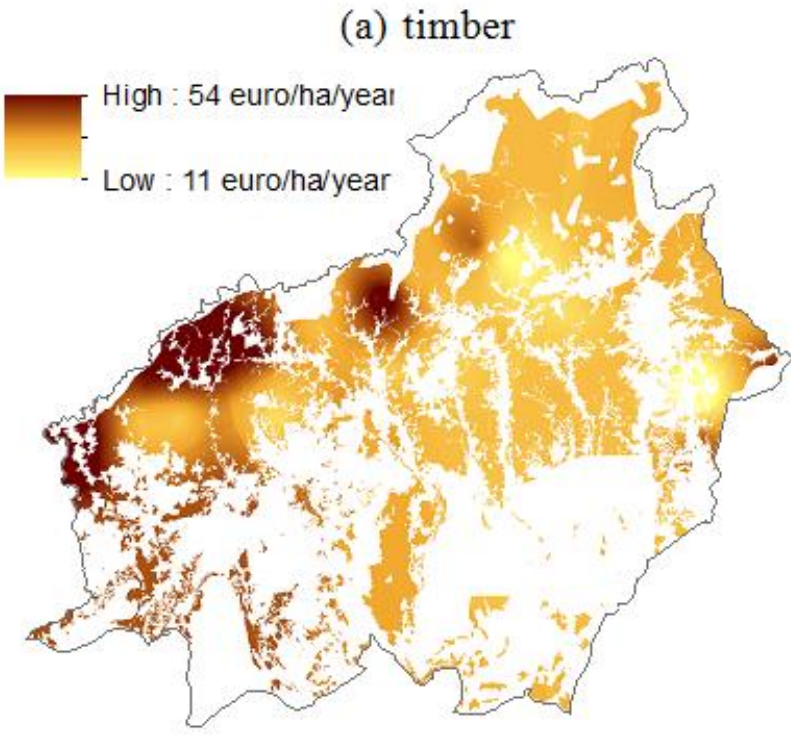
Source: Remme et al., 2015

Monetary values Limburg (million euro/year)

Ecosystem service	Biophysical quantity	Gross revenue (million €)[b]	Monetary value
Crop production	$1.9 * 10^9$ kg produce[a]	386	45.9
Fodder production	$0.8 * 10^9$ kg dm fodder[a]	86	10.2
Drinking water extraction	$28 * 10^6$ m^3 water[a]	104[c]	10.8
Air quality regulation	$2.3 * 10^6$ kg PM_{10}[a]	–	2.0
Carbon sequestration	$61 * 10^6$ kg C[a]	–	2.0
Nature tourism	$1.0 * 10^6$ tourists	248[d]	38.7
Hunting	$1.7 * 10^3$ km^2 hunting ground	–	2.6
Total			112

Source: Remme et al., 2015

Monetary value of timber harvest in Central Kalimantan (150,000 km^2)



Source: Sumarga et al., 2015

- Valued using a resource rent approach, on the basis of a map of physical supply of timber in timber concessions.
- It is assumed that harvest is equally spread throughout concessions, even though in reality every year 1/36th of the concession is harvested.
- Other services valued and mapped: recreation, rice, oil palm and rattan production, carbon sequestration

Thank you

- Uestions?