Theme 1:
Identifying and quantifying ecosystem and landscape functions and services

Rob Bugter & Cees Kwakernaak

ALTERRA
WAGENINGEN UR

Program

14:00 Introduction of the main knowledge questions - Cees Kwakernaak

14:15 RUBICODE (Rationalising biodiversity conservation in dynamic ecosystems) - Rob Bugter

14:30 Soil systems and ecosystem services - Peter de Ruiter

14:45 Services and products from multi-functional constructed wetlands - Adrie van der Werf

15:00 Discussion (till 15:30)

Voting

- Please vote for at least 5 questions
- Indicate top priority by 1, second by 2 etc.
- Please give questions of same importance the same ranking number

ALTERRA
WAGENINGEN UR

[Theme/Challenge 1]

Theme 1 Identifying and Quantifying Ecosystem & Landscape Functions and Services

Research objective: to identify and quantify the relationship between physical and spatial landscape characteristics and the associated functions and services, and to define possible critical management thresholds.

*Below the main research questions/challenges have been listed based on input from the Symposium Participants and the SELS Steering Committee. Please indicate (vote) for **at least 5 (sub) questions** you think SELS should focus on the coming 3-4 years. Please give the in your view most important question no. 1, the 2nd most no. 2 etc. (you may number as many as you want but at least five). In case questions are in your view similar, or have the same importance, you can give them the same ranking-number. If you miss a question, please add it to the list*

Key questions identified by Participants and by Steering group / from literature

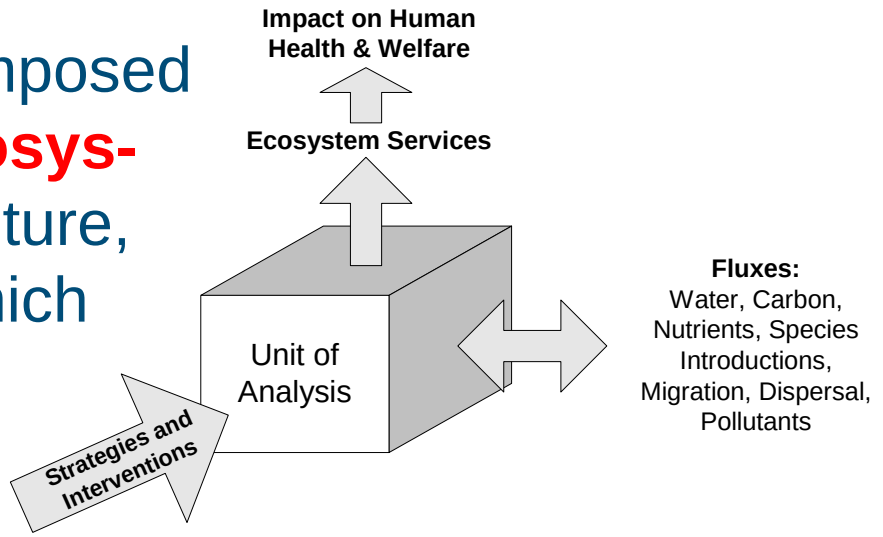
		Vote
a.	**How can relationships between landscape and ecosystem characteristics and their functions and associated goods and services be identified and quantified?**	
	The different approaches in functional analysis	
	Identifying and quantifying ecosystem services in urban and peri-urban areas	
	The quantitative contribution of natural processes and biodiversity in producing E&L services	
	Soil Biodiversity, Soil Food Webs, Quantification Soil Ecosystem Processes,	
	What service of green landscape elements relate to good air quality?	
	Develop audit tools to assess the extent to which existing green spaces offer health benefits	
	Biodiversity (functional diversity) as a precondition for realization of ecosystem services and (spatial) conditions for the services	
	How to construct a national indicator which represents impact of E&LS (also new theme)	
b.	**What is the spatial distribution of E&L functions and how can they be mapped ?**	
	The use of spatial indicators and ecological cartography as analytic tools (also theme 4)	
	How to link land cover / ecosystem management with provision of ecosystem services	
c.	**What is the effect of dynamic conditions (spatial and temporal) on services in terms of sustainability and resilience ?**	
	The main driving forces behind changes in E&L Services (what about the goods?)	
	How are functions influenced by autonomous developments, such as climate change? And how can these functions contribute to making green-blue environments more resilient to these autonomous developments?	
	Vulnerability of E&LS for climate change	
	Multifunctionaliteit van het ruimtegebruik	
	The role of environmental services and selection of indicators in the context of adaptation and spatial planning	
d.	**Can critical thresholds be defined?**	
	What are possible critical thresholds for resilience and sustainability ?	
e.	**How can interactions between E&L functions and services be modeled ?**	

Ecosystem and landscape functions

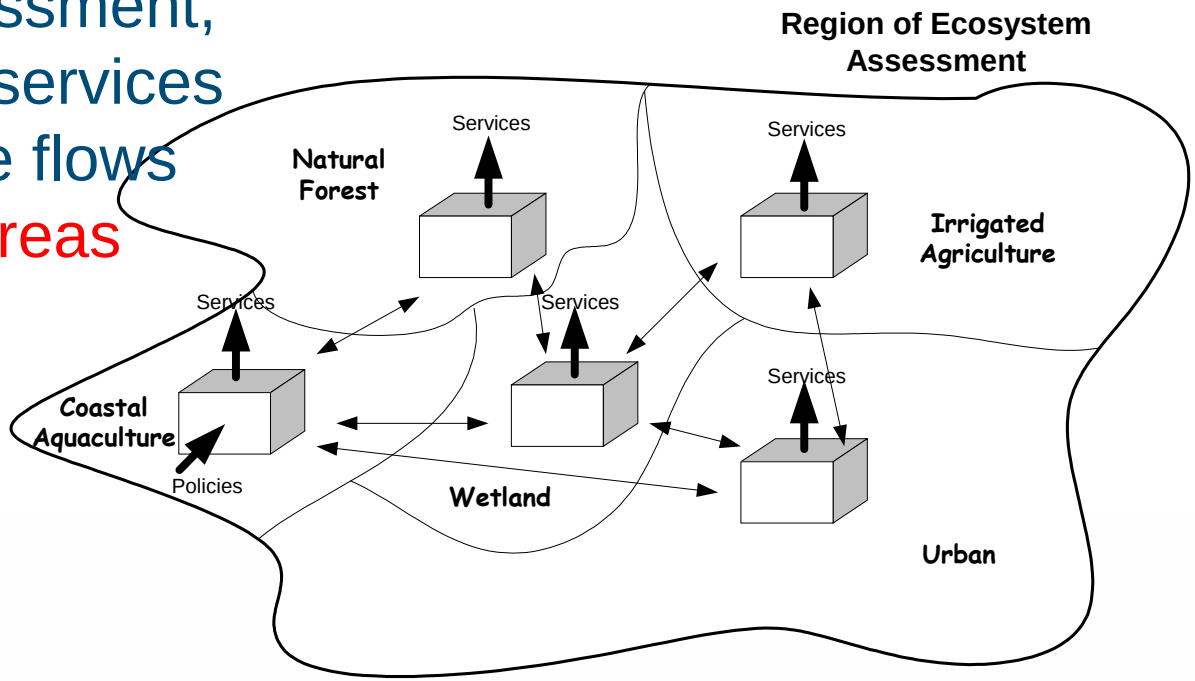
- **Ecosystem processes**
  - The interactions (events, reactions or operations) among biotic and abiotic elements of ecosystems that lead to a definite result (Tirri *et al.*, 1998; Wallace, 2007)
  - *In broad terms, these processes involve the transfer of energy and materials* (Lyons *et al.*, 2005; Wallace, 2007)
- **Ecosystem functions**
  - *Redundant term synonymous with Ecosystem Processes* (Wallace, 2007)
  - **The capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly** (De Groot, 1992)
- **Landscape functions**
  - Ecosystem functions within a landscape context

Multiple services and multiple scales

"A landscape is typically composed of a number of **different ecosys-tems**, such as forest, agriculture, and urban areas, each of which produces a different bundle of services". (MA, 2005).



"In an ecosystem assessment, both the production of services from each area and the flows of materials between areas must be assessed" (MA, 2005).



ALTERRA
WAGENINGEN UR

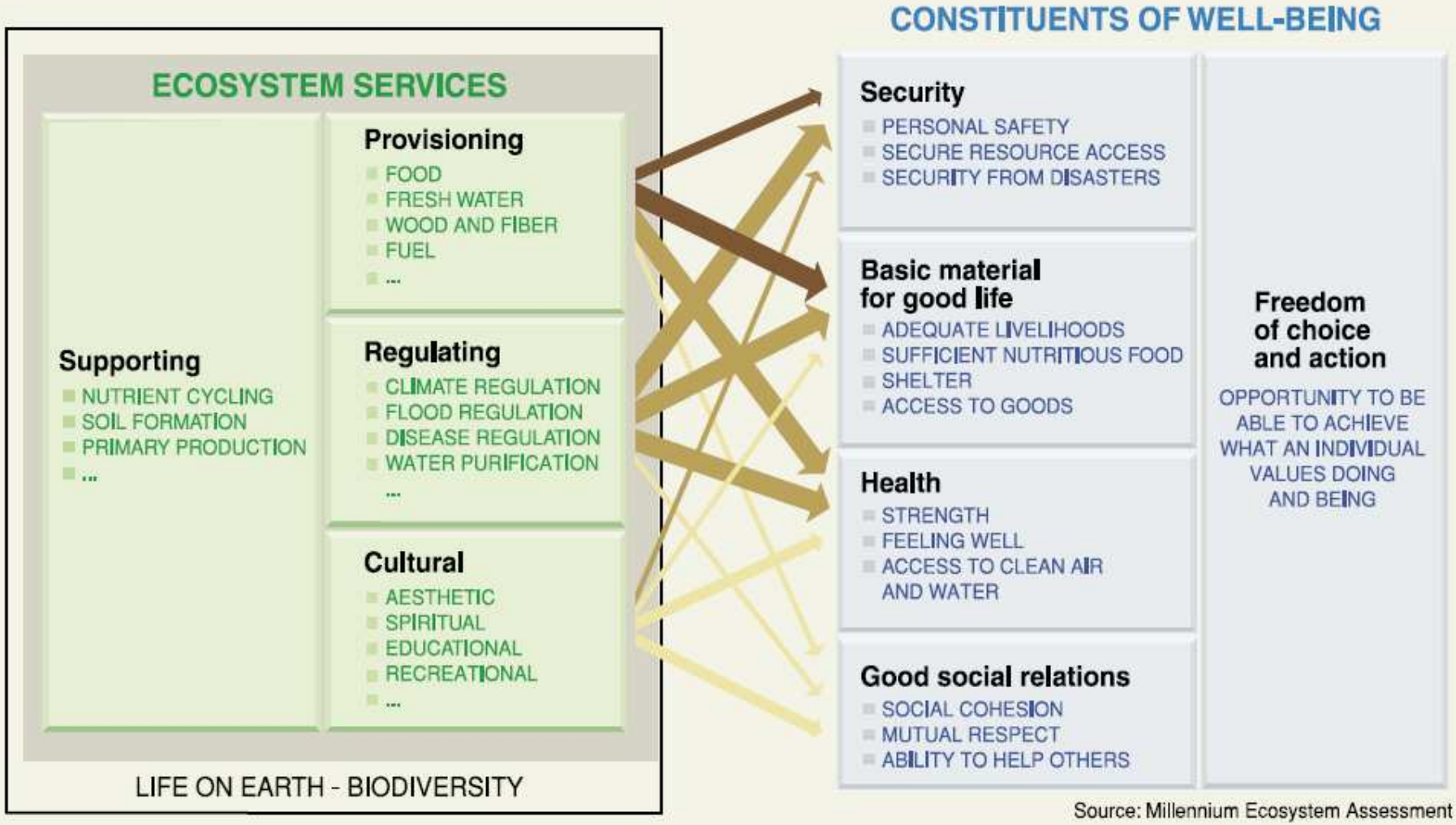
Ecosystem and landscape services

Benefits that humans obtain from ecosystems (landscapes) that support, directly or indirectly, their survival and quality of life

These include provisioning, regulating and cultural services that directly affect people, and the supporting services needed to maintain the direct services. They are a subset of Ecosystem Processes, which include roles that are not easily definable in terms of human needs

(Enlarged from Millennium Ecosystem Assessment, 2003)

Linkages between Ecosystem Services and Human Well-being



Source: Millennium Ecosystem Assessment

ARROW'S COLOR
Potential for mediation by socioeconomic factors

- Low
- Medium
- High

ARROW'S WIDTH
Intensity of linkages between ecosystem services and human well-being

- Weak
- Medium
- Strong

Theme 1: Objective & research questions

Research objective:

To identify and quantify the relationship between physical and spatial landscape characteristics and the associated functions and services, and to identify possible critical management thresholds.

Key research questions

1. *How can relationships between landscape and ecosystem characteristics and their functions and associated goods and services be identified and quantified?*
   - The different approaches in functional analysis
   - Identifying and quantifying ecosystem services in urban and peri-urban areas
   - The quantitative contribution of natural processes and biodiversity in producing E&L services
   - Soil Biodiversity, Soil Food Webs, Quantification Soil Ecosystem Processes
   - What service of green landscape elements relate to good air quality?
   - Develop audit tools to assess the extent to which existing green spaces offer health benefits
   - Biodiversity (functional diversity) as a precondition for realization of ecosystem services and (spatial) conditions for the services
   - How to construct a national indicator which represents impact of E&LS (also new theme)

Key research questions (continued)

2. *What is the spatial distribution of E&L functions and how can they be mapped ?*
   - The use of spatial indicators and ecological cartography as analytic tools (also theme 4)
   - How to link land cover / ecosystem management with provision of ecosystem services

Key research questions (continued)

3. *What is the effect of dynamic conditions (temporal and spatial) on (interactions between) services, in terms of sustainability and resilience of service delivery?*
   - The main driving forces behind changes in E&L Services (what about the goods?)
   - How are functions influenced by autonomous developments, such as climate change? And how can these functions contribute to making green-blue environments more resilient to these autonomous developments?
   - Vulnerability of E&LS for climate change
   - Multifunctionaliteit van het ruimtegebruik
   - The role of environmental services and selection of indicators in the context of adaptation and spatial planningVulnerability of E&LS for climate change

Key research questions (continued)

4. *Can critical thresholds be defined ?*
   - What are possible critical thresholds for resilience and sustainability *?*

5. *How can interactions between E&L functions and services be modeled ?*

Program

14:00 Introduction of the main knowledge questions - Cees Kwakernaak

14:15 RUBICODE (Rationalising biodiversity conservation in dynamic ecosystems) - Rob Bugter

14:30 Soil systems and ecosystem services - Peter de Ruiter

14:45 Services and products from multi-functional constructed wetlands - Adrie van der Werf

15:00 Discussion (till 15:30)