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ECOSYSTEM SERVICES, A USEFUL CONCEPT FOR THE RESTORATION OF ESTUARIES?

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Introduction

- Managing estuaries in the face of climate change and the many human pressures is one of the major challenges of the 21st century:
 - Harbour development
 - Land reclamation
 - Pollution
 - ...
- The Schelde estuary (Netherlands & Belgium) is a typical example

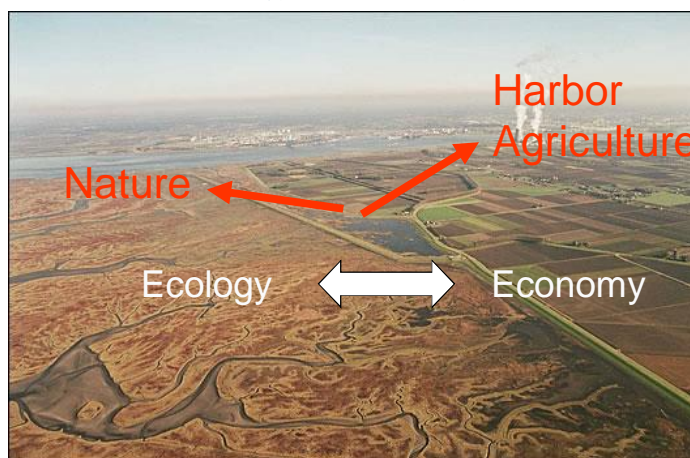
Introduction

The challenges for managing the Schelde estuary are manifold:

- Transboundary issues
- Economic importance (e.g., Port of Antwerp)
- Major changes in morphology and hydrodynamics
- Ecological degradation

Introduction

Ecology vs. Economy ?

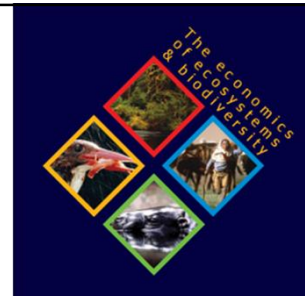


Introduction

The conflict between economical and ecological-oriented management is not always a real conflict.

- ➔ Integrated management of a complex ecosystem (such as the Schelde estuary) should be based on a better understanding of the functioning of the system and how we can derive the benefits from the system
- ➔ The concept of Ecosystem Services could be used to improve integrated management

Ecosystem Services



What are ecosystem services?

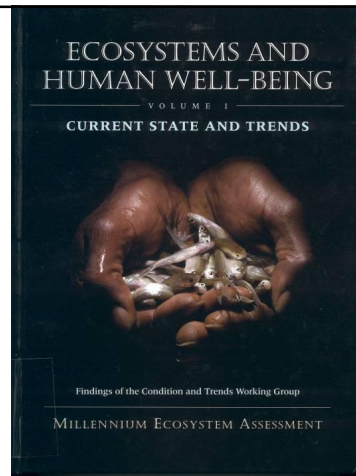
"The direct and indirect contributions of ecosystems to human wellbeing"

(TEEB, 2010)

Ecosystem Services

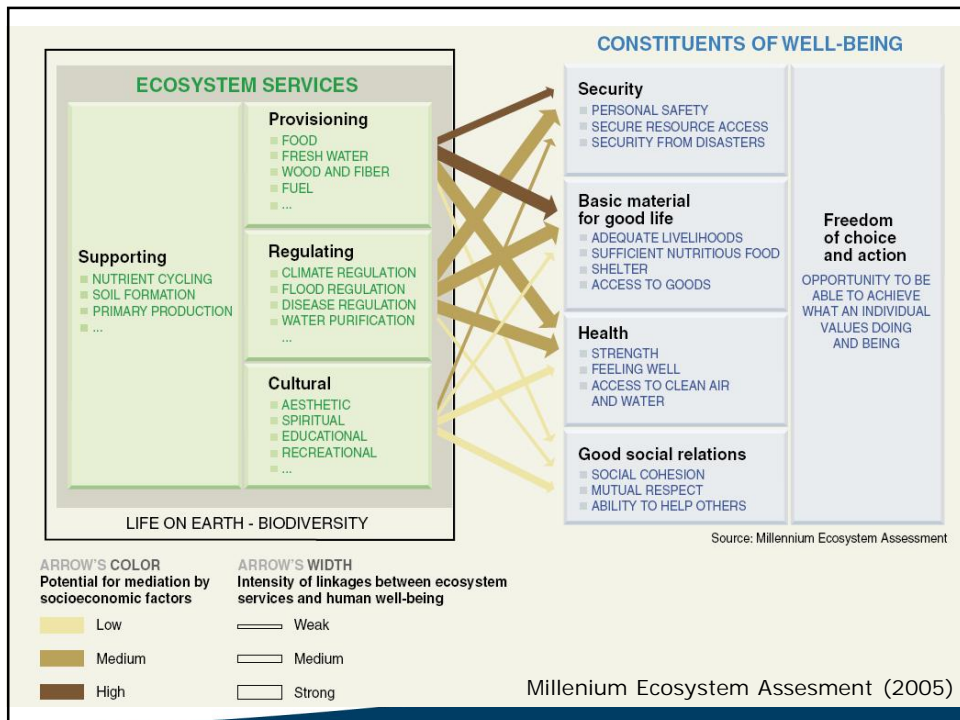
Ecosystem Services concept gained rapid attention:

- Costanza et al. *Nature* (1997)
- Millenium Ecosystem Assesment (2005)



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^{††}



Ecosystem Services

articles

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for 16 biomes, based on published studies and a few original calculations. For the entire biosphere, the value (most of which is outside the market) is estimated to be in the range of US\$16–54 trillion (10¹²) per year, with an average of US\$33 trillion per year. Because of the nature of the uncertainties, this must be considered a minimum estimate. Global

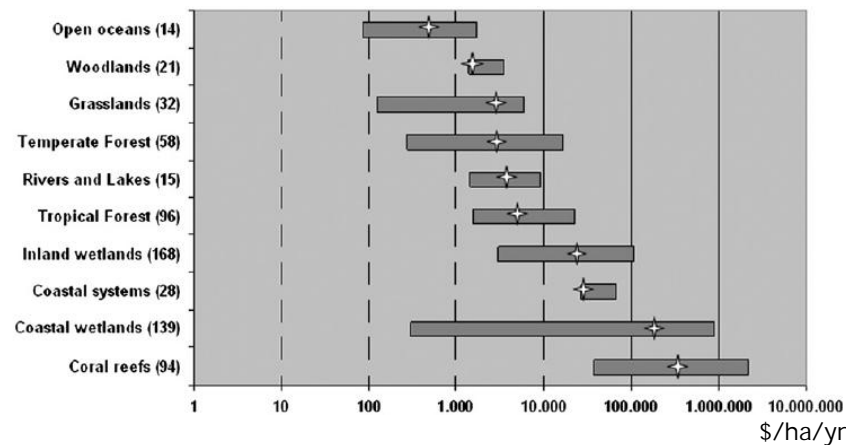
^{¶¶} Ecological Economics Research and Applications Inc., PO Box 1589, Solomons, Maryland 20688, USA

The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support system. They contribute to human welfare, both directly and indirectly, and therefore represent part of the total economic value of the planet. We have estimated the current economic value of 17 ecosystem services for 16 biomes, based on published studies and a few original calculations. For the entire biosphere, the value (most of which is outside the market) is estimated to be in the range of US\$16–54 trillion (10¹²) per year, with an average of US\$33 trillion per year. Because of the nature of the uncertainties, this must be considered a minimum estimate. Global gross national product total is around US\$18 trillion per year.

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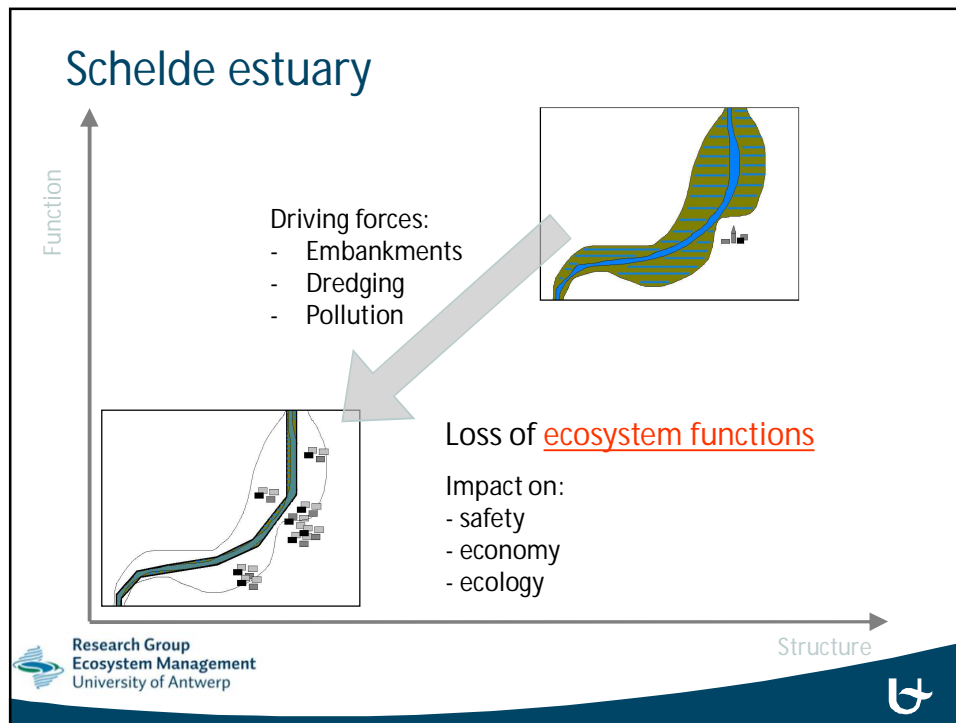
Ecosystem Services



De Groot et al. 2013. *Ecosystems Services*

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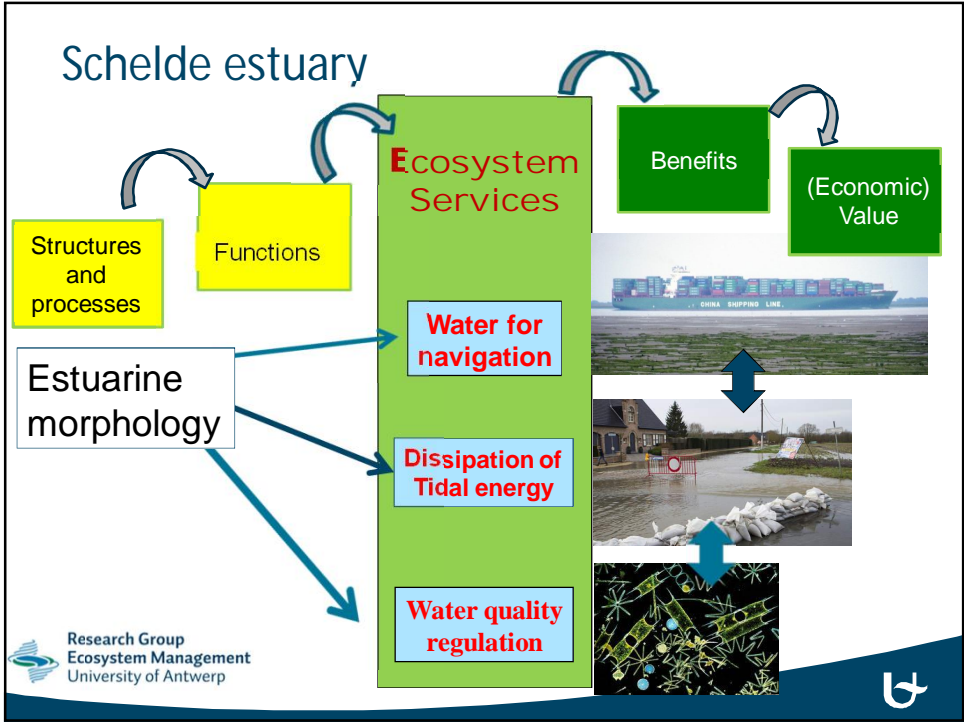
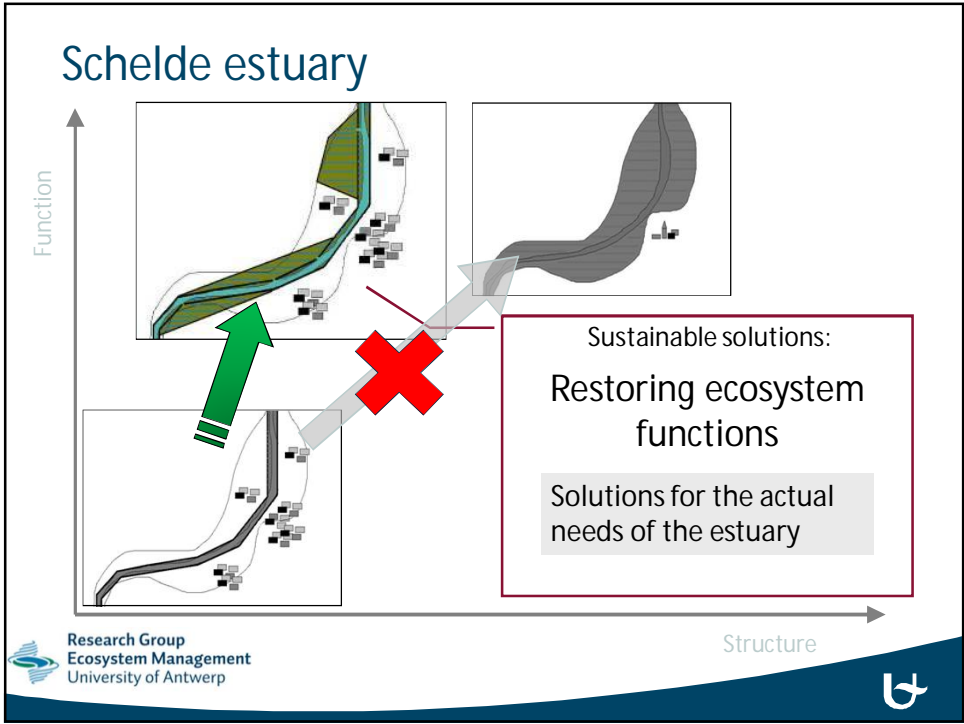


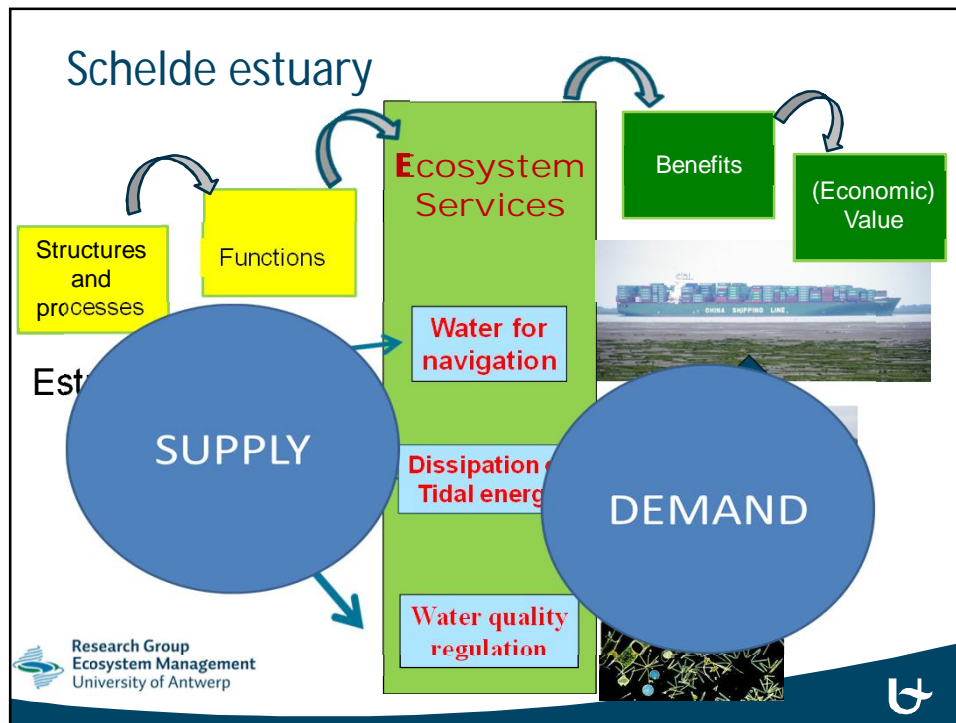


Schelde estuary

	Main service types
PROVISIONING SERVICES	
1	Food (e.g. fish, game, fruit)
2	Water (e.g. for drinking, irrigation, cooling)
3	Raw Materials (e.g. fiber, timber, fuel wood, fodder, fertilizer)
4	Genetic resources (e.g. for crop-improvement and medicinal purposes)
5	Medicinal resources (e.g. biochemical products, models & test-organisms)
6	Ornamental resources (e.g. artisan work, decorative plants, pet animals, fashion)
REGULATING SERVICES	
7	Air quality regulation (e.g. capturing (fine)dust, chemicals, etc.)
8	Climate regulation (incl. C-sequestration, influence of vegetation on rainfall, etc.)
9	Moderation of extreme events (eg. storm protection and flood prevention)
10	Regulation of water flows (e.g. natural drainage, irrigation and drought prevention)
11	Waste treatment (especially water purification)
12	Erosion prevention
13	Maintenance of soil fertility (incl. soil formation)
14	Pollination
15	Biological control (e.g. seed dispersal, pest and disease control)

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An integrated strategy

➔ Formulate goals for different ecosystem services

Ecosystem services can be:

- A volume of water that can be stored on marshes
- Amount of primary production needed to sustain the nursery function
- Retention of nutrients
- Buffering tidal energy

An integrated strategy

Translate the required goals into type and surface of habitats needed, as well as the best spatial distribution

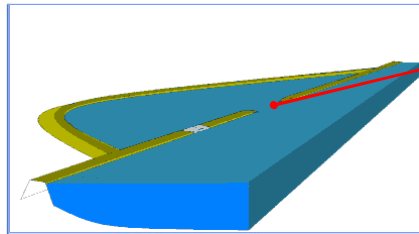
Required surface of different habitats

	Habitattype	opp (ha)
Tidal habitats	Buitendijks brak	740
	Buitendijks zoet	1040
	Binnendijks bos alluviaal	570
Non tidal habitats	Binnendijks anderen	370
	Binnendijks grasland dotter (RBB)	840
	Binnendijks grasland anderen	910
	Binnendijks riet/ruigte	560
	Binnendijks plas/oever	240

Example: Lippenbroek pilot project

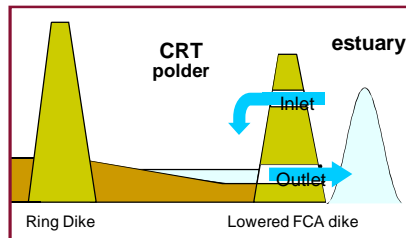


Example: Lippenbroek pilot project



Safety: FCA

- Overflow dike
- only during storm, full capacity
- 1 - 2 times/year

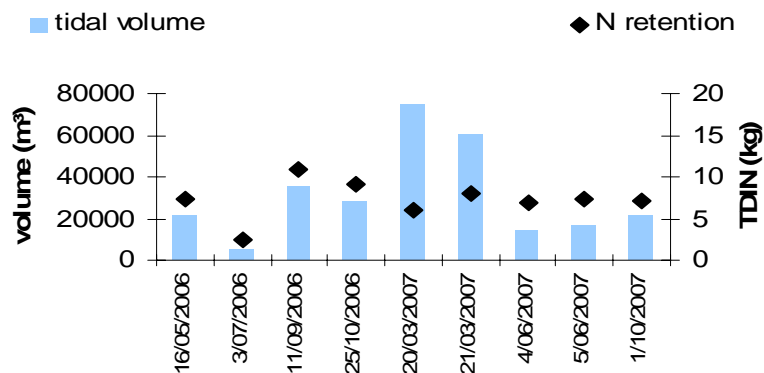


Concept FCA – CRT:
Safety and Ecology

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Example: Lippenbroek pilot project



Retention of 1 kg Nitrogen per ha per high water period

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Other examples: Bergenmeersen



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Other examples: Kruibeke-Bazel-Rupelmonde

Ready for the big work



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Conclusions

- ➔ The concept of ecosystem services gave us a better insight in the real impact of changes in the Schelde estuary
- ➔ Habitat loss resulted in a loss of regulating services
- ➔ Loss of an ecosystem service can be seen as an economic loss.

Conclusions

- Integrated approach requires an understanding of the functioning of the system as a whole, especially of the main driving forces
- Restoration projects should aim at having an impact on this main driving forces.
 - ➔ Restore for a function and not for a structure!
- Concept of ecosystem services can be a valuable tool for integrated management
 - ➔ Formulate goals for ecosystem services!

Thanks for your attention

More info?

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